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DEFENSE INDUSTRY BULLETIN

August 1969

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DEFENSE INDUSTRY BULLETIN

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The *Bulletin* serves as a means of communication between the Department of Defense, its authorized agencies, defense contractors and other business interests. It provides guidance to industry concerning official DOD policies, programs and projects and seeks to stimulate thought on the part of the Defense-Industry team in solving problems allied to the defense effort.

Suggestions from industry representatives concerning possible topics for future issues are welcomed and should be forwarded to the Editor at the address shown below.

The *Bulletin* is distributed free of charge to qualified representatives of industry and of the Departments of Defense, Army, Navy, and Air Force. Subscription requests should be submitted on company letterhead stationery, must indicate the position title of the requestor and be addressed to the Editor, Defense Industry Bulletin, OASD (PA), Pentagon, Washington, D. C. 20301.

Contents of this magazine may be freely reprinted. Mention of the source will be appreciated.

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The rapid emergence of the helicopter as a major weapon system in the Army inventory has caused a virtual rewriting of the tactical rule book. Opportunities for exploiting these versatile craft in combat have brought concomitant problems in the avionics area. These problems—and proposed Army solutions—are discussed in "Army Helicopter Avionics," featured in this issue.

Avionic Requirements for Army Helicopter Operations

Raymond R. Hefter

Present-day ground warfare has expanded from the conventional dawn-to-dusk limited operations to continuous, 24-hour, full scale operations. For airmobile tactics the implication is clear: significant aviation electronic equipment improvements are required for night and adverse weather flight operations in order to increase the effectiveness of the ground forces.

The current Army inventory includes both fixed and rotary wing aircraft systems. Rotary wing systems include the UH–1 (Iroquois) series utility transports; the CH–47 (Chinook) series light tactical transports; the OH–6A (Cayuse) and the OH–58A light observation helicopters; the AH–1G (Cobra) attack helicopter; and the CH–54 (Flying Crane).

Fixed wing aircraft systems include the OV–1 (Mohawk) series surveillance aircraft, and the U–8 and U–21 utility and special mission aircraft.

These rotary and fixed wing aircraft systems, with the exception of a limited number of specially equipped vehicles, contain non-integrated avionics systems made up of various functional black boxes and having limited capability for continuous operations.

Several future (near term) aircraft systems are now in concept formulation, or in the early planning phase:

- Utility Tactical Transport Aircraft System (UTTAS).
- Heavy Lift Helicopter (HLH).
- Manned Aerial Vehicle for Surveillance (MAVS).
- Light Tactical Transport Aircraft System (LTTAS).

The UTTAS, HLH, MAVS and LTTAS are proposed replacements for the UH–1, CH–54, OV–1 and CH–47, respectively. To these last four aircraft systems we assign highest priority in terms of providing improved avionics capabilities.

Avionics systems or components evolving from any of these system development programs may be considered for application to present aircraft systems during phased rebuild programs, but only on a cost-effective basis.

The avionics for UTTAS and any other new aircraft systems should be "Integrated Ground-Airborne Avionics Systems." There should be integration and functional modularity within the aircraft and on the ground, among multiple aircraft, and between aircraft and the ground. The extent of integration and/or confederation will depend ultimately upon time, technology, cost, and effectiveness considerations. These advanced avionics systems will consist of modular and integrated computation (central or confederated), multipurpose sensors and displays, and standard digital interface between sensors, computation, displays, and controls.

The main thrusts of this integrated systems approach are embodied in the modular design concept which will provide:

- Enhanced mission reliability through the implementation of graceful mode degradation. (The system must be designed to sustain a reasonable degree of combat damage and still continue to function.)
- Increased commonality and standardization, through the use of complete systems or portions thereof, in both sophisticated and less complex Army aircraft systems, across the tactical fleet.
- Standard digital interface (format, levels, rates, etc.) between sensors, computation elements, displays and controls.
- Improved future growth potential and flexibility, without major redesign and retrofit, to afford easy interchange and/or addition of sensors. (The avionics system fielded with a new aircraft will very probably change significantly during the useful

life of the aircraft.)

- Increased mission and cost effectiveness by allowing subsystems, not required for a mission, to be removed from the system without affecting the operation of other system functions.
- Significant gains in terms of weight, reliability, vulnerability, and other system characteristics, versus a non-integrated macro-system (or black box) approach for a given technology base.

Scope of Technical Effort

The major technical areas of effort that are required to achieve these goals must include systems engineering and man-machine interface; technology improvement; and system effectiveness measurement. These four areas must be addressed by the Government to provide guidance to industry during concept formulation and for contract definitions.

Systems Engineering.

Systems engineering includes systems analyses, synthesis, simulation and, ideally, feasibility flight test demonstration. System analyses are required by the developing agency to translate those operational requirements, embodied in the applicable aircraft system Qualitative Materiel Development Objective (QMDO) and pertinent Army Combat Developments Command studies, into technical characteristics.

Systems syntheses are also required to define avionics system and subsystem specifications, identify candidate technology for tradeoffs, identify candidates for technology improvements (in size, weight, power consumption, cost and reliability), and identify technology gaps. The output of these efforts will enhance logistic commonality for the Army across the aircraft fleet, insure that problems peculiar to the Army (improved air-ground interactions, map-of-the-earth operations, etc.) are adequately addressed, and identify discrete technical characteristics.

Man-Machine Interface.

Early definition of an acceptable crew station layout is required in order to guide industry through the various phases of the development cycle leading toward the fielding of the first operational unit. The Army pilot is unique in that he must be capable of flying not just one type aircraft but, in many cases, virtually any within the inventory. Therefore, a thorough analysis is required to maximize commonality of aircraft system crew stations and, ultimately, minimize transition training difficulties from one aircraft to another.

Crew station design can be accomplished initially in the simulation phase of system engineering and in the feasibility flight test phase. While simulation does provide a carefully controlled laboratory environment, in which exact cause and effect relationships can be quantitatively established, simulation does not eliminate the need for real-world feasibility flight tests. Feasibility flight tests are performed with an in-service test bed aircraft, and existing hardware, to prove conceptual feasibility.

Technology Improvements.

The technology program is a dual effort. For those avionics subsystems whose performance borders on or has reached the tactical payoff limit (*e.g.*, radar altimeters, doppler velocity sensors, communications transceivers, etc.), the major thrust of technology enhancement will be directed toward significant reductions of size, weight, power consumption and cost, and improvement of reliability. In those areas where technology or operational experience is not as extensive (*e.g.*, gunfire detectors, steep approach and landing, obstacles sensors, etc.), the thrust of technology will be to obtain the best level of performance capability within a specified time frame.

System Effectiveness.

It is vital that the Government identify effectiveness criteria, in terms of critical performance parameters, their boundary limits, and the sensitivity of total aircraft system mission performance to changes in these parameters. These criteria are just as necessary for avionics as they are for airframe, fire control, and weapons. These criteria must be provided to industry in concept formulation, so that the sensitivities of the avionic performance requirements are understood and can be applied in tradeoff decisions. Further, the Government must use these criteria, preferably in the form of an effectiveness model, as a yardstick to adequately and fairly judge competitive contract definition phase proposals in accordance with a well defined frame of reference.

Government-Industry Interface

Government and industrial efforts are performed by and through appropriate Army Material Command subordinate commands and the applicable project manager. During concept formulation, the Government must perform and/or support operational analyses to define system operational requirements, and mission and performance envelopes. Further, the Government must translate these operational requirements into technical characteristics. The required concept formulation systems engineering, man-machine interface, technology candidate developments, and system effectiveness modeling are performed by appropriate government and industrial groups.

Industry is required to pay particular attention to parametric design studies for alternative system approaches and tradeoff decisions.

UTTAS is presently in the concept formulation phase. More comprehensive concept formulation investigations are planned for the MAVS project which will involve flight test demonstrations, procurement of prototype equipment, integration of contractor- and government-furnished equipment in test bed aircraft, flight testing and data reduction of test re-

Raymond R. Hefter is Staff Assistant for Advanced Planning to the Director of the Avionics Laboratory, U.S. Army Electronics Command, Fort Monmouth, N. J. His background in systems engineering and technical management includes the OV–1 reconnaissance/surveillance aircraft systems and the AH–56A advanced aerial fire support system. Mr. Hefter holds a B. S. degree in physics from Muhlenberg College.

sults, as well as parametric design and tradeoff studies.

Since funding for concept formulation studies is normally small compared to total program costs and with the anticipated contract definition phase, industry investment in those internal research and development activities to improve its competitive position often occurs. This applies to potential vendors for all aircraft subsystem equipments, as well as potential prime contractors.

The breakout of contractor-furnished equipment (CFE) versus government-furnished equipment (GFE), determined during negotiations with the contract definition contractors, could result in complete CFE, complete GFE, or an intermix of each. This subject has received much attention in the last few years but always should be decided on the basis of which (CFE or GFE) is best for the Government. For the Army, commonality across the fleet is obviously desirable, if not mandatory, in order to reduce to a minimum the maintenance and logistics tail in an airmobile environment.

Problems in Helicopter Avionics

It is the purpose of airborne avionics to enhance the capability of the crew to perform various missions (transport, weapons, surveillance, command control, etc.) in the most efficient and cost-effective manner. This should be the criteria in the design, development and evaluation of all avionics.

Since the Army's principal tactical airmobile vehicle is, and will most likely continue to be, the rotary wing aircraft, it is important that we examine those major characteristics and uses which are unique to such vehicles and which impose constraints on airborne avionics design. These constraints are categorized in three major groupings.

Physical Constraints.

The major physical limitations of helicopters as aircraft include inefficient lifting characteristics, inherent instability, and relatively wide speed ranges. The lift capabilities and, therefore, the useful load limitations of helicopters, as compared to fixed wing aircrift, are well known. In general, helicopter use in tactical operations places a premium on weight reduction to a far greater degree than in other air vehicles. In order to increase reliability and reduce weight, size and electrical load requirements in airborne electronics for Army aircraft, application of solid state devices, microelectronics, and flush-mounted antennas have been applied to communications equipment. The Standard Lightweight Avionics Equipment (SLAE)—formerly identified as the Light Observation Helicopter Avionics Package (LOHAP)—has resulted in a weight saving of about 55 pounds over that of the "standard" equipments for VHF–FM, VHF–AM, UHF–AM, intercommunications and Automatic Direction Finder (ADF), or 45 pounds versus 100 pounds.

In meeting the challenge of providing significant improvements in night and adverse weather flight operations, as mentioned at the outset, application of these techniques (and others yet to evolve) to the other avionics functions of navigation, instrumentation, environment sensing (terrain avoidance, formation flight), landing and air traffic regulation must be made. Although microelectronics have been applied in the design of many of these subsystems and are available today, *e.g.*, the Integrated Helicopter Avionics System (IHAS) further improvements can be made by designing multipurpose sensors, and through the application of large-scale integrated circuits to the current generation of subsystems.

The alleviation of inherent problems, associated with current rotary wing aircraft, can be more efficiently provided by electronic techniques than by mechanical and/or electromechanical combinations. This is true to an even greater degree when advanced VTOL aircraft systems are considered or when applying automatic IFR flight modes to "conventional" rotor craft, both requiring dynamic control through a computer-aided outer loop or automatic flight path control system. Therefore, in order to unburden the pilot and provide greater efficiencies in flight and mission accomplishment in the more demanding environmental modes of operation envisioned for the near-term and longer-range systems, highly reliable electronic flight control systems (fly-by-wire) coupled with integrated computation and displays are required.

Environmental Constraints.

The spectrum of vibration frequency found in helicopters include those encountered in fixed-wing aircraft of 25cps and above and also the lower range, down to 4 or 5cps. Double displacement amplitudes as great as 0.1 inches are also encountered at numerous resonances. Vibrational environments of these kinds have resulted in many operational equipment failures and mechanically induced electronic interferences. Emphasis on the application of increased reliability requirements and reliability testing of new equipment will assist greatly in reducing these problems. Development of vibration isolators, which can cover the full spectrum of vibration/amplitude ranges encountered, may also assist.

High ambient cockpit noise, either in an enclosed cockpit or with open cockpit doors, as encountered in some armed helicopters present both a human factors and an inter-crew communications problem. Notch-type microphone filters and selective sound proofing are current solutions to improve crew comfort, reduce fatigue, and improve the quality of communications (air-to-air, air-to-ground and intercrew). The development of improved airframe soundproofing and new contact microphones (skull or throat types) are further possible solutions.

Turning rotors have caused rotor modulation interferences to ADF and Visual Omni Range (VOR) equipments, and the effect on high frequency equipments is still somewhat undefined. Induced low frequency interference and aircraft antenna masking and reflections still exist. Normal downwash effects over the fuselage makes aerodynamic instrumentation almost impossible during flight and hover. Flying sand, dust and stones during lift-off, hover, ground taxi and landing add operational and maintenance woes. Although not its primary purpose, pierced aluminum planking has helped somewhat in regard to sand and dust. The elimination and/or compensation of rotor modulation and the development of new types of mechanical and/or electrical aerodynamic instrumentation still pose real challenges.

Static electricity buildup in flight and during hover may produce low frequency navigation interference and personnel safety hazards during

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Procurement of Life-Supporting Supplies for the Armed Forces

Brigadier General William M. Mantz, USA

Proper clothing, good meals, and medical supplies are vitally important to each soldier, sailor, marine and airman in military service. Procurement and distribution of these life-supporting supplies—clothing, food and medical materiel—is the mission of the Defense Personnel Support Center, 2800 S. 20th St., Philadelphia Pa., a field activity of the Defense Supply Agency.

Common-use supplies procured by the Defense Personnel Support Center (DPSC) range from socks, underwear, uniforms, footwear, various types of military rations and drugs to highly sophisticated hospital equipment.

Approximately 27,800 items in the military part of the Federal Catalog are centrally managed by DPSC. Inventory in the three commodity areas at the end of 1968 was about $1.4 billion. Issues or sales to customers during FY 1968 totaled $2.33 billion, and the center's obligations amounted to $2.1 billion.

Organization and Operation

The Defense Supply Agency (DSA) established the Defense Personnel Support Center in July 1965 by moving the Defense Subsistence Supply Center from Chicago, Ill., and the Defense Medical Supply Center from New York City, and consolidating them with the Defense Clothing and Textile Supply Center at Philadelphia. The new DPSC was established with its present commodity-functional organization, including organizational elements for determination of supply requirements, technical quality assurance, procurement, and the necessary administrative elements, such as legal, comptroller, personnel, etc. DPSC also operates a clothing factory which manufactures orders normally too small for industry contractors, pilot models for research and development, and special measurement garments. The in-house factory provides capability for immediate response to urgent demands, and furnishes production and design technology to contractors.

Clothing, textiles, and medical supplies are procured by DPSC at Philadelphia, but most food items are bought through Subsistence Regional Headquarters organizations strategically located throughout the United States. Addresses of DPSC Subsistence Regional Headquarters are:

- Chicago—536 S. Clark St., Chicago, Ill. 60605.
- Kansas City—607 Hardesty Ave., Kansas City, Mo. 64124.
- Los Angeles—Federal Building, 312 N. Spring St., Los Angeles, Calif. 90012.
- New Orleans—4400 Dauphine St., New Orleans, La. 70140.
- New York—Third Ave. and 29th St., Brooklyn, N. Y. 11232.
- Oakland—2155 Webster St., Alameda, Calif. 94505.
- Richmond—c/o Defense General Supply Center, Richmond, Va. 23219.
- Seattle—Pier 91, Seattle, Wash, 98119.

To assure the quality of everything DPSC buys, specifications provided by the Military Services are used when solicitations are issued to industry. After a contract is awarded, DSA's Defense Contract Administration Services (DCAS) organization administers the contract, with primary responsibility for insuring contractor compliance with specifications. Technical assistance is provided to DCAS by the center, when requested. Most of DCAS quality assurance technical people are in day-to-day contact with contractors, and they are backed up by engineers and product specialists who are avaiable when new or unusual problems arise. Also, DCAS has recently developed a quality audit providing for an independent product evaluation by personnel other than the individuals directly responsible for inspection and acceptance.

While the volume of business and the center's concern for quality are essential ingredients of supply management, achievement of efficiency and economy are also major elements of concern. That part of the story can best be illustrated by relating the

Brigadier General William M. Mantz, USA, has been Commander of the Defense Personnel Support Center, Defense Supply Agency, since November 1967. Before this assignment, he served as Commanding General, U. S. Army Natick Laboratories, Natick, Mass., and, during his tenure there, General Mantz assumed additional duty as Commanding General, Army Materiel (Mechanics) Research Command, Watertown, Mass. General Mantz holds a B.A. degree from Whitman College, and an M.B.A. degree from George Washington University.

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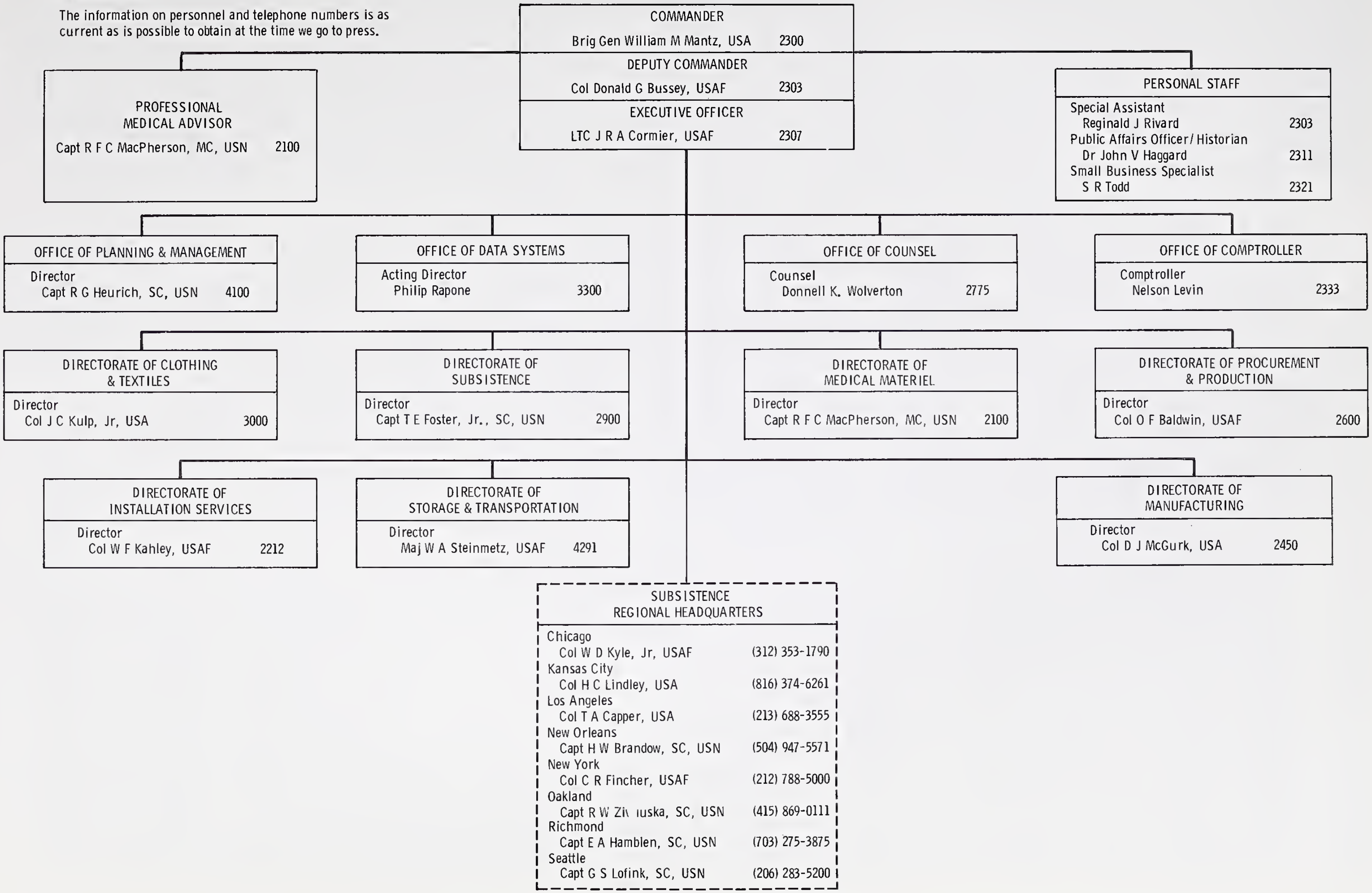
Editor's Note: Organization charts appearing in the Bulletin are edited by the editorial staff to reflect those elements of the various DOD organizations which are of interest to industry representatives. Organizational elements not involved in the DOD-industry relationship have been eliminated because of space limitation.

The information on personnel and telephone numbers is as current as is possible to obtain at the time we go to press.



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DEPUTY COMMANDER
Col Donald G Bussey, USAF 2303
EXECUTIVE OFFICER
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Director
Capt R G Heurich, SC, USN 4100

OFFICE OF DATA SYSTEMS
Acting Director
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Director
Capt R F C MacPherson, MC, USN 2100

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Director
Col O F Baldwin, USAF 2600

DIRECTORATE OF INSTALLATION SERVICES
Director
Col W F Kahley, USAF 2212

DIRECTORATE OF STORAGE & TRANSPORTATION
Director
Maj W A Steinmetz, USAF 4291

DIRECTORATE OF MANUFACTURING
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Col D J McGurk, USA 2450

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New Orleans Capt H W Brandow, SC, USN	(504) 947-5571
New York Col C R Fincher, USAF	(212) 788-5000
Oakland Capt R W Zivnuska, SC, USN	(415) 869-0111
Richmond Capt E A Hamblen, SC, USN	(703) 275-3875
Seattle Capt G S Lofink, SC, USN	(206) 283-5200

development of the supply situation since July 1965 and the savings made during this period.

Two Major Problems

In the summer and fall of 1965, the center was faced with two major problems simultaneously. First, there was the transfer of the subsistence headquarters operation from Chicago to Philadelphia, and the medical materiel activity from New York. At the same time came the initial shock of the Southeast Asia buildup and its rapidly mounting supply requirements. Loss of trained personnel resulting from the consolidation added to the criticality of the problems.

At the time of consolidation in 1965, the three commodities were incompatible insofar as automatic data procedures, formats, criteria, and other details in the billing of customers were concerned. By March 1966, however, one system had been developed for all three commodities. As a result of this development, 32 computer programs were eliminated.

By the end of the first fiscal year, consolidation had been successfully accomplished. However, by that time, supply demands from Southeast Asia had mounted to almost unmanageable proportions. For example, the demand for Meal Combat Individual (the modern version of the "C" ration of World War II) jumped from 28,872,000 in FY 1964 to 154,266,000 in FY 1966. The center obligated $1,314.4 million for food, clothing and medical materiel in FY 1965. In FY 1966, it obligated $2,684.2 million for these commodities, doubling total procurements in a brief span of 12 months.

Acceleration of the Vietnam fighting came at a time when the center's stocks in the three commodity areas were relatively low. There were inadequate mobilization stocks, primarily because of budgetary limitations. Furthermore, the clothing industry was going through the most unprecedented boom in the national economy. Thus, the center was trying to support a war under peacetime conditions.

As a result of the shortage of on-hand stocks and the problems of consolidation of three centers into one, supply performance suffered during the first six months in FY 1966.

By the early months of calendar year 1968, the center had solved most of its supply management problems, and percentages in stock availability, on-time fill, and backorders had reached normal peacetime levels.

Feeding the Troops in Vietnam

In supplying perishable food to Vietnam, the problem was not lack of availability, but rather lack of in-country refrigeration capacity in Vietnam, lack of a sufficient number of reefer vessels in which to ship items that must be kept under refrigeration, and loss of shelf-life during the long ocean voyage. This situation persisted for a period of about 16 months, but has now been alleviated by improved in-country facilities and increasing use of refrigerated container shipment.

The support and cooperation of American industry in no small measure aided the solution of problems to meet the military subsistence needs in Southeast Asia. Since the early days of the Vietnam buildup, the food industry has been requested to supply non-perishable military subsistence in completely unitized loads, protected against rough handling and prolonged outdoor storage in a tropical atmosphere. All non-perishable food supplies destined for Southeast Asia must be loaded on high quality four-way pallets, produced according to requirements of rigid military specifications. The unit containers—tin cans—must be OD coated and packed in solid fiber, water-resistant cases; these cases must then be placed on pallets protected by a polyethylene shroud and encased in solid fiberboard sheating; and, finally, they must be strapped to the pallet itself.

All of these requirements have created many problems for an industry which is normally geared to short transportation hauls, short storage periods, and quick turnover in the commercial market.

The box industry had to convert from the manufacture of corrugated fiberboard to solid water-resistant V-Board. It had to manufacture great quantities of water-proof plywood. Pallet manufacturers had to convert from the production of relatively inexpensive lightweight pallets of soft wood to sturdy pallets of hard wood.

Another major problem was the sudden requirement for many food items which had not been procured in quantity since the days of the Korean War. Included among them a wide range of operational and combat rations and great quantities of canned meat products. Specifications had to be quickly updated to recognize new technology and processing methods developed by industry during the period since the Korean War. Again, through efforts of government food scientists and the unlimited cooperation of industry technologists, this operation was accomplished with dispatch.

Solving the Clothing Needs

In the clothing area, the introduction of new items particularly suitable for the Southeast Asia environment also presented problems. The lightweight tropical uniform, which had been initially standardized in 1963 for the Army Special Services Forces, was promptly adopted by the Army, Air Force and Marine Corps. The direct molded sole tropical combat boot also became a high-demand item. The Army and Marine Corps placed exceedingly high demands for this boot. The boot was first procured in 1963 but as late as 1965 there was only one manufacturer in the country who could produce it, and he was making only 50 pairs a day.

A second phase of this clothing problem area was the magnitude of requirements for some 15,000 items with military characteristics, most of which are not used by the civilian population. To get the required supplies on time, the center intensified its internal integrated operations among item managers, technical specalists, and contracting officers. It then worked closely with the Military Services to reduce unit allowances to servicemen, and to reduce stock levels in posts, camps and stations. Wherever necessary, specification requirements were temporarily relaxed to make it easier for new contractors to manufacture military items. Technical and production personnel of the DPSC clothing factory furnished advice and assistance to contractors in the fabrication of new uniform items.

In all three commodity areas managed by DPSC, military demands created a need for substantial industry orientation to effectively transmit these demands to contractors and to lay before them programmed procurements as far distant into the future as could adequately be forecast. Through constant conferences with the heads of clothing, food and medical materiel manufacturers, the cen-

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ABOUT PEOPLE

DEPARTMENT OF DEFENSE

Gilbert W. Fitzhugh, who has held the position of Chairman of the Board and Chief Executive Officer of Metropolitan Life Insurance Co. since 1966, has been appointed Chairman of a Blue Ribbon Panel to study the organization of the Defense Department, its research and development programs, and its procurement practices. Secretary of Defense Laird has said he expects this panel to conduct the most comprehensive review of DOD since the Hoover Commission studies of 1947 and 1953.

Robert J. Pranger is the new Dep. Asst. Secretary of Defense for Near East and South Asian Affairs, Office of the Asst. Secretary of Defense (International Security Affairs).

Paul Wollstadt has been named Dep. Asst. Secretary of Defense (Manpower and Reserve Affairs) for Manpower Research and Utilization.

Yuan-Li Wu has been sworn in as Dep. Asst. Secretary of Defense for Policy Planning and Arms Control, Office of the Asst. Secretary of Defense for International Security Affairs.

David M. F. Lambert has assumed the duties of Dir., Small Business and Economic Utilization, in the Office of the Asst. Secretary of Defense (Installations and Logistics).

RAdm. John P. Sager, USN, has been named Exec. Dir., Technical and Logistics Services, Defense Supply Agency, Alexandria, Va.

RAdm. Donald M. White, USN, is the new Dep. Dir. for Inspection Services, Office of Asst. Secretary of Defense (Administration).

Brig. Gen. Chester J. Butcher, USAF, has been named Chief, Requirements and Development Division Office of the Joint Chiefs of Staff. **Col. William J. Evans, USAF,** (brig. gen. selectee) replaces Brig. Gen. Butcher as Dep. Dir. for Concepts and Operational Readiness, Defense Communications Planning Group.

Brig. Gen. Theodore S. Coberly, USAF, has been assigned as Commander, Defense Contract Administration Services Region, Defense Supply Agency, Los Angeles, Calif.

Brig. Gen. Vernon R. Turner, USAF, has replaced **Brig. Gen. Robert J. Meyer, USAF,** as Dir., Aircraft and Missiles Office, Office of the Asst. Secretary of Defense (Installations and Logistics). Brig. Gen. Meyer has retired.

Col. James R. Pugh Jr., USAF, (brig. gen. selectee), is the new Exec. Dir., Procurement and Production, Defense Supply Agency, Alexandria, Va.

Col. Elmer D. Howk, USAF, has been named as Dep. Commander, Defense Logistics Service Center, Defense Supply Agency, Battle Creek, Mich.

DEPARTMENT OF THE ARMY

Maj. Gen. Andrew P. Rollins Jr. has been confirmed as President, Mississippi River Commission, Vicksburg, Miss. He has also succeeded **Maj. Gen. R. G. MacDonnell** as Div. Engineer, Lower Mississippi Region, Army Corps of Engineers. Maj. Gen. MacDonnell has retired.

Brig. Gen. Mahlon E. Gates is the new Asst. Dep. for Research and Laboratories, Army Materiel Command, Washington, D.C.

Brig. Gen. James G. Kalergis has reported to the Army Materiel Command as Comptroller and Director of Programs.

Dr. L. R. Shaffer has been appointed Asst. Dir., Army Corps of Engineers Construction Engineering Research Laboratory, Champaign-Urbana, Ill.

Col. Ernest H. Davis has assumed the post of Dir. of Concepts and Plans, Army Combat Developments Command, Fort Belvoir, Va.

DEPARTMENT OF THE NAVY

Gen. Lewis W. Walt, USMC, Asst. Commandant of the Marine Corps, received his fourth star in ceremonies in Washington, D.C., June 2.

RAdm. Thomas S. King Jr. has been named as Dep. Commander and Chief of Staff, Military Sea Transport Service, Washington, D.C.

The Navy Department has announced the appointment of **RAdm. Raymond E. Peet** as Dir., Office of Program Affairs, Washington, D.C.

Capt. Cyril T. Faulders Jr. is the new Project Manager for the All-Weather Carrier Landing Systems Project, Naval Material Command, Washington, D.C.

Capt. Edmund B. Mahinske has been chosen as Dir., Naval Electronics Systems Command Center, Atlantic Div., Portsmouth, N.H.

DEPARTMENT OF THE AIR FORCE

Gen. John D. Ryan has succeeded **Gen. John P. McConnell** as Chief of Staff of the Air Force. Gen. McConnell has retired. His successor as Vice Chief of Staff is **Gen. John C. Meyer.**

Gen. Howell M. Estes Jr., Commander, Military Airlift Command, Scott AFB, Ill., retired August 1. His replacement is **Gen. Jack J. Catton,** who was concurrently promoted to the rank of general.

Gen. Seth J. McKee was promoted from lt. gen. and has replaced **Gen. Raymond J. Reeves** as Commander, North American Air Defense Command and Commander, Continental Air Defense Command. Gen. Reeves retired August 1.

Maj. Gen. Joseph R. DeLuca has replaced **Maj. Gen. Frederick E. Morris Jr.** as Commander, Advanced Logistics Systems Center, AFLC, Wright-Patterson AFB, Ohio. Maj. Gen. Morris is now Dir., Data Automation, Office of the Air Force Comptroller, Hq., U.S. Air Force.

Brig. Gen. Leo A. Kiley, Commander, Office of Aerospace Research, Washington, D.C., has retired.

Maj. Gen. Andrew J. Kinney, Commander, Armament Development and Test Center, AFSC, Eglin AFB, Fla., has retired. His successor is **Maj. Gen. Jewell C. Maxwell.**

Maj. Gen. John L. McCoy, Dep. Chief of Staff for Plans, AFLC, Wright-Patterson AFB, Ohio, has retired.

DOD-Industry Reciprocity Advances Composite Materials Technology

Doctor Alan M. Lovelace

Combined efforts of Government and industry have verified the most optimistic predictions for aerospace structural composite materials. Prototype hardware, fabricated under Air Force contract or through independent research and development efforts and currently in-service on an experimental basis, has established technological feasibility and has confirmed that substantial weight savings and performance improvements can be achieved through the use of reinforced composite materials. Equally important, tremendous interest and enthusiasm has been generated in industry, and a truly broad cross section of the aerospace industry is now involved in structural composite development.

The Defense Department structural composite materials program is under the direction of the Air Force Systems Command (AFSC). It is the outgrowth of extensive in-house and contract research, sponsored by AFSC's Air Force Materials Laboratory (AFML), which demonstrated the great potential of boron and graphite fiber reinforced composite materials for aerospace structural applications. This potential is due to strength and stiffness (modulus of elasticity) to density ratios far superior to conventional materials.

The total technology concept applied to the advanced composite materials program requires consideration of many factors, such as materials properties, design concepts, design procedures, stress analysis methods, manufacturing methods, component testing, cost effectiveness, and system compatibility. The AFML objective is to fully acquaint industry with the practical structural utilization of reinforced composite materials; and to design, fabricate and test full-scale, flight-worthy hardware that will conclusively demonstrate the advantages of these materials. Therefore, aerospace structural hardware development was introduced in the beginning stages to provide a real-life focus on both progress and problems. This has resulted in vigorous and early training of the using industry in the structural hardware product form it will eventually market.

Structural composite materials have advanced from the research stage to experimental use, and the actual experience obtained in the design, fabrication and test of composite primary structures has instilled a high degree of engineering confidence. Cost effectiveness and producibility are still areas of concern although considerable progress has been made, particularly in the areas of filament and preimpregnated tape production.

Development of Concept

Concepts involved in high-modulus, high-strength fiber reinforced composites were proposed and documented by AFML in 1958, and were based on boron as well as other materials. Contract development procurement action was initiated in 1959, and a contract for development of continuous boron filament was placed with Texaco, Inc., in 1960. After two to three years of development effort, the cost of boron filament was in the area of $3,000 per pound.

At the time the DOD advanced development program was implemented, in 1965, boron filament had achieved a 70-pound-per-month output capacity at a cost of approximately $1,000 per pound. Further process development efforts resulted in the direct payoff of production type processes for filament with minimum tensile strength of 400,000 psi (average of 460,000 psi), 60 million psi modulus, and good filament diameter control. This development eliminated costly and wasteful filament etching treatment. The processing knowledge established by these efforts stimulated a competitive filament supply situation and, as a result, boron filament is now available at a cost of approximately $250 per pound. This cost reduction is particularly encouraging in view of the low volume of filament produced to date. Primary boron filament producers presently have a total annual capacity of over 5,000 pounds, which can be rapidly escalated to a production level of 50,000 to 100,000 pounds a year.

While the bulk of the harware fab-

Doctor Alan M. Lovelace is Director of the Air Force Materials Laboratory, Wright-Patterson AFB, Ohio. He chaired the Boron Working Group of the Air Force Systems Command Ad Hoc Task Force, and his findings and recommendations provided the basis for the implementation of the DOD structural composite materials program and encouraged independent composite research programs by industrial firms. He holds bachelor, master and doctoral degrees from the University of Florida.

ricated has utilized boron filament, graphite fibers have rapidly come to the fore with the promise of strength/weight/modulus properties competitive with boron filament, and prices competitive or lower than boron filament. Graphite fiber development was initiated by AFML in 1964. An important advantage is that the composite technology employed in boron can be applied to the composite technology utilizing graphite structures.

Graphite fibers have certain advantages over boron, such as lower density, easier plastic composite formability due to the flexibility of the multifilament graphite fiber yarn compared with the monofilament boron, and higher modulus to weight ratio. Disadvantages are anisotropy of the fiber and the requirement for a surface treatment for bonding to matrix resins.

Production Techniques

Development of production techniques for a variety of high-quality specification controlled boron tape material had a tremendous impact on fabrication of advanced composite structures. While considerable emphasis was placed on the development of high-strength/high-modulus fibers and high-temperature/high-strength laminating resins, composite strength depends to a great extent on fiber orientation. Optimum tensile strength and modulus are obtained when the boron fibers are coated uniformly with the resin and are collimated with regulated spacing between fibers. (This is not required for the multifilament graphite yarns and is another advantage of graphite.) Efforts were directed toward developing processing techniques for conversion of reeled filament into high-quality collimated, preimpregnated multifilament tape. The resulting controlled filament orientation and ease of handling of the tape, as compared with the handling of individual filaments, have a direct bearing on composite quality and the ease and reproducibility of the fabrication processes used to arrive at a completed composite end item.

A concerted effort has been made by the Air Forc Materials Laboratory to inform industry of the advantages of fiber reinforced composite materials and to encourage independent research. As a direct result of this close association, several independent industrial organizations have acquired equipment, and have improved processes for producing and marketing both filament and tape materials on a commercial basis. Thus, a competitive industrial situation evolved which has greatly reduced filament and tape costs.

The Materials Laboratory, assisted by other organizations of the Air Force Systems Command, such as the Air Force Flight Dynamics Laboratory and the Aeronautical Systems Division's Deputy for Engineering, provided guidance to industry concerning not only efficient material formation processes, but also the technical requirements mandatory for flight-worthy structure. This has been a key factor in the successful progression of the advanced composite demonstration items from laboratory specimens to full-scale filament reinforced composite hardware structural assemblies.

Producibility and reliability are primary considerations in hardware fabrication. First-generation prototype equipment development was pioneered by AFML. Prototype automated skin laying equipment is in existence at organizations such as General Dynamics/Fort Worth, Grumman, Boeing Vertol, McDonnell Douglas, Lockheed/Georgia, etc. This equipment is compatible with numerical control techniques and has the potential for low-cost, lightweight, and high-speed composite fabrication. Additionally, material scrappage rates of 10 percent and under compare favorably with the high scrappage rates involved in metallic structures. Long-range projections indicate that advanced composite aircraft structure will not only be vastly superior in performance, but may also cost less than conventional aluminum aircraft structure.

Hardware development has primarily involved aircraft but activity has been undertaken in the reentry vehicle, aeropropulsion, and helicopter rotor blade structure areas to a varying extent. All of these applications indicate that utilization of advanced composites offer potential for significant performance improvements.

In 1966, the F–111 horizontal stabilizer was selected as a test bed on which to develop and demonstrate the technology. This program culminated in the fall of 1968 with the fabrication of full-scale, flight-worthy structures. This hardware saved 300 pounds (27 percent) over the weight of a current aluminum ship set. The weight savings emanate primarily from the skin area. The aluminum skins weigh 426 pounds, compared with 146 pounds for the boron skins. This reflects a conservative and subsituation type design; undoubtedly even further weight reductions can be achieved by conceptual redesign of this type structure.

A major milestone of this program was the fabrication and test of two 5-by-5-foot primary load-bearing midsections of the stabilizer. With the support of the Air Force Flight Dynamics Laboratory, the first section was tested to destruction, which occurred at 89 percent of design ultimate load or 133 percent of operating design stresses. The second section was fatigue tested at Wright-Patterson AFB, Ohio, to four aircraft lifetimes, after which it was static tested to 75 percent of design ultimate. The program to develop the flutter-critical F–111 horizontal stabilizer is highly significant because of the complete materials/design/structure technology it provides.

A wing trailing edge panel was also fabricated for the F–111A. After 100 hours of flight test, no sign of deterioration or damage of this piece of secondary structure was evident. Limited production of the wing trailing edge panels has been initiated and these are being incorporated on F–111A production aircraft. These panels will provide both production cost and schedule information, and an in-depth service test program.

Another limited production program is in progress to develop the left hand in-board leading edge slat of the C–5A. This is representative of both larger and contoured membrane type secondary structures.

Independent Research and Development Efforts

In addition to items being fabricated under Air Force contract, a number of structural composite hardware items have been developed through independent research and development. Flight test items in experimental use include:

- General Dynamics/Fort Worth is flying an F–111 with a lower wing surface airflow deflector door and an aft main landing gear door, using boron epoxy composite skin and full-depth aluminum honeycomb structure. These parts completed a one-year in-service period, with 80 hours of flight time, and were left on the aircraft for continued service testing.

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Spare Parts Supplier to the Armed Forces

Rear Admiral G. C. Heffner, SC, USN

A hardware store with an average of 20,000 individual sales each calendar day of the year, with a catalog listing approximately 600,000 "nuts and bolts" items, with an inventory valued at over $350 million, and with sales totaling more than $280 million a year—this, in essence, describes the Defense Industrial Supply Center (DISC), located at 700 Robbins Ave., Philadelphia, Pa.

The nuts and bolts in this instance are the items used for normal maintenance, overhaul and repair of military equipment. The DISC catalog of merchandise ranges from rope to nails, chain to electrical wire, and bearings to ferrous metal. Altogether, about 80 percent of the requisitions from our military customers are in the hardware area. Thirty-seven percent of the "sales" are strictly hardware, 24 percent in metals, and 19 percent in wire and cable. In all, the DISC catalog represents 25 percent of the total number of items managed by the Defense Supply Agency (DSA), of which the center is a field activity.

DISC is responsible for managing and purchasing 85 percent of the items in its catalog. The Military Services manage 10 percent, and the remainder is decentralized for local purchase. Item turnover in the system is continuous, and each year the Services transfer more and more items to DSA and DISC. In 1967 alone, there was a net increase of 55,000 items to the list of centrally managed items, and in 1968 the increase was 80,000.

In 1963, DISC first accepted responsibility for providing support to the priority weapon systems of the Military Services. Initially, each Service nominated one weapon system for a test program. The Army nominated the Hawk missile; the Navy, the Polaris; and the Air Force, the Minuteman. Since then the Services have entrusted an additional 20 major weapon systems for DISC support. Among the systems now supported are the UH–1 Iroquois and CH–47 Chinook helicopters, the KC–135 Stratotanker, the B–52 Stratofortress, the F–105 Thunderchief, and the M–16 rifle. A total of 42,680 items have been identified as related to major weapon systems.

Scope of Management

The DISC operation is similar to that of any commercial corporate body. From our capital account, merchandise is bought and then "sold" to the Army, Navy and Air Force—DISC customers. They pay us in dollars. Those dollars are used to buy new merchandise to continue sales. If the merchandise purchased does not sell, markdowns result and dollars are lost from our capital fund. In that respect, as any merchant dealing in profit and loss, we must assure that we buy only items that sell, and do this with a minimum of investment. DISC inventories must be held down, and our effectiveness is compared with other inventory control points.

Competent management of industrial military supplies requires the collection and use of control data in a scope and depth that exceeds most other centrally controlled DSA commodities, reflecting the almost universal application of hardware, fasteners, metals, bearings, and similar items in the industrial realm. In contrast to several other types of material which can be managed efficiently on the basis of personnel strength, equipment, population and operating hours, or definite technical applications, DISC's industrial-type items require a comprehensive analysis of past demands, supplemented by reporting and prompt response to material needs for special maintenance programs and new construction.

Thus, on occasion, if an item is continually being used and the manufacturer is in a continual process of manufacturing the item, then the manufacturer and DISC procurement people get together on a requirements contract. This allows the center to reduce inventories and lead time, and distribution is made directly from the manufacturer's production line to the military customer.

Rear Admiral G. C. Heffner, SC, USN, has been commander of the Defense Industrial Supply Center since August 1967. In previous assignments, he served with the Defense Supply Agency as Inspector General; and was Commanding Officer of the Naval Supply Center, Long Beach, Calif., from 1964 to 1966. Admiral Heffner holds a B.S. degree from the University of Washington, and an M.B.A. degree from the Graduate School of Business, Stanford, Calif.

DEFENSE INDUSTRIAL SUPPLY CENTER

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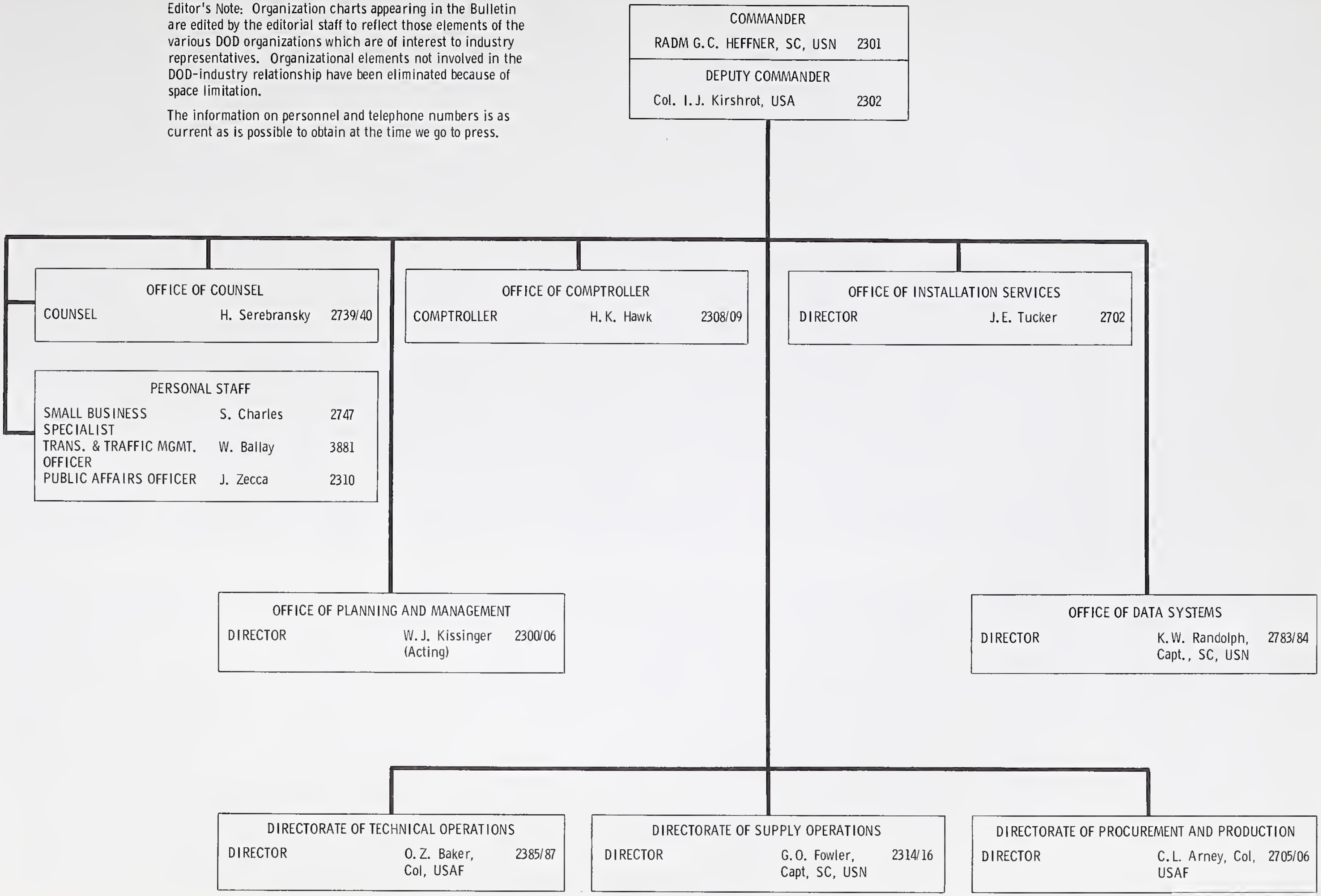
Editor's Note: Organization charts appearing in the Bulletin are edited by the editorial staff to reflect those elements of the various DOD organizations which are of interest to industry representatives. Organizational elements not involved in the DOD-industry relationship have been eliminated because of space limitation.

The information on personnel and telephone numbers is as current as is possible to obtain at the time we go to press.



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With an extensive overall lead time for procurement and delivery, it is always a challenge to determine what items and in what quantity they should be stocked at each depot. One way not to run out of stock, of course, is to have plenty of it, but inventories cost. Thus, DISC managers and supply analysts strive to reduce inventories, yet retain sufficient stock to meet urgent military demands.

Computer Automation

However, the center's mission involves more than just simply keeping an inventory of salable items. To meet the needs of the Military Services, DISC must provide a responsive supply effort.

In its supply operation, the center renders bills to about 20,000 customers. The large volume and variety of transactions related to receipt, issue and accountability have required the installation of large-scale, high-speed computer and communication equipment. Also, DISC was recently given the assignment of exploring the feasibility of optical scanning equipment in its computer configuration.

Almost all requisitions from military units are received at DISC electronically. They are separated from other administrative traffic and processed by computers to determine material availability. When a material source is registered the computer flashes a release order to a depot, sends a status notice to the consignee, and adjusts on-hand records.

When material is not available, back orders are automatically recorded by a computer and a notice is printed out for manual review and processing by inventory managers for determination of action required. In all, approximately 80 percent of the decisions as to what to buy, when to buy, how much to buy, where to place the materials, and instructions for release of material from a depot to a military customer are made by the computer.

Automation of the requisition processing and procurement function in DISC achieved a significant reduction of lead time. Many factors make up the salient features of this automation. Inventory reviews and requirements determination accomplished under a mechanized supply/demand review system result in computer recommendations for stock replenishments. Another system receives incoming material requests from customers and provides an output for manual review of requirements which cannot be satisfied from available assets.

These requests are converted to computer processable input and entered into the computer where they are reviewed for accuracy, validity and urgency. A purchase request document is computer printed for delivery to the Directorate of Procurement and Production to start the actual buying process. Purchase requests contain the necessary descriptive/technical data, names of previous suppliers, previous prices paid for the items, as well as the quantities required and the storage location so that procurement can be consummated in a minimum time period.

The data processing and communication facilities enable incoming and outgoing traffic to be processed without requiring conversion of network traffic to typed messages or data card format. High-speed communications, for instance, are used to transmit data between the center and depots handling DISC material concerning requisition processing, as well as to communicate with military customers on such matters as requisition status.

Unlike other DSA centers, DISC does not have an indigenous supply depot. Instead, it uses DSA depots and Navy installations in its distribution pattern. Depots in support of DISC items are located in Columbus, Ohio; Mechanicsburg, Pa.; Memphis, Tenn.; Ogden, Utah; and Tracy, Calif. In addition, the Naval Supply Center in Norfolk, Va., is used for support of all military activities in the Atlantic and Mediterranean theaters of operation, while the Naval Supply Center, Oakland, Calif., is used for the Pacific and Southeast Asian theaters.

For the distribution of metals, DISC uses nine direct supply support points, located at high-volume user sites, such as Naval Shipyards and Naval Supply Centers. This concept provides efficient and economical distribution direct to the user by positioning the heavy bulk metals at the point of ultimate consumption.

Purchasing Methods

DISC buys material in support of its commodity management responsibility on the basis of formal advertising or negotiating. In this regard, a central bidders' mailing list is maintained consisting of more than 2,500 manufacturers and suppliers to contact when in a buy position. The list is subdivided into categories of materials obtainable from groupings of suppliers. It is never static but changes from time to time, with new firms being added and those firms that show no interest or prove unreliable being deleted. To be added to the bid list, all a potential contractor needs to do is visit or write the Defense Industrial Supply Center, 700 Robbins Ave., Philadelphia, Pa. 19111, and ask to be included in a specific commodity area by completing a Bidder's Mailing List Application.

In the procurement process two methods of purchasing are used: formal advertising and negotiation. In both methods, maximum competition is obtained. Formal advertising is used for purchases which are expected to exceed $2,500 and the item can be adequately described for extensive and free competition. Negotiation is used when formal advertising is not feasible and one of 17 exceptions authorized by law are present. These 17 exceptions include, among others, such circumstances as public exigency, where time is of paramount importance; classified purchases which should not be publicly disclosed; and purchases under $2,500 which are consummated by use of small purchase procedures.

During the last fiscal year, 140,480 procurement awards were made to industry by DISC valued at $284 million. Awards in labor surplus areas totaled $9.5 million, while small business firms received awards amounting to $116.9 million.

Consistent with DOD policy, DISC partially sets aside procurements for award to suppliers in labor surplus areas. These partial labor surplus area set-asides are made when the procurement is severable into two or more production runs or reasonable lots, and one or more labor surplus area concerns are expected to have technical competency and productive capacity to produce a severable portion of the procurement at a reasonable price.

Similarly, DISC sets aside procurements, either totally or partially, for award to small business concerns.

Both the Labor Surplus Area Program and the Small Business Program contain features which permit DISC to recognize a contractor's efforts in hiring and training the hard-core disadvantaged. They also allow DISC to give first preference in the award of a partial labor surplus area set-aside to certified-eligible concerns which are also small business concerns, while second preference is accorded to certified-eligible concerns which are not small business concerns.

To become a certified-eligible concern, a supplier must apply to the Department of Labor through a local U.S. Employment Service. The firm must be located in or near an area of concentrated unemployment or underemployment which has been certified by the Department of Labor with respect to the employment of disadvantaged persons residing in such areas, and the firm must agree to perform or cause to be performed at least 25 percent of the contract price in or near such section.

In keeping with the close relationship between DISC and the industries in which it deals, the center has been given the assignment as the coordinating activity for industry advisory committees in the commodity areas of fasteners, bearings, hardware, and electrical wire and cable. These committees are composed of senior industrial managers from the industries concerned, personnel from the Army, Navy, Air Force, Marine Corps and DSA, along with representatives of the Business and Defense Service Administration of the Department of Commerce. The committees offer the opportunity of direct interchange of information among the center, industry, and the activities which use the products, in an effort to solve any problems related to procurement, item standardization, or supply.

With high-speed communication and computer capability enhancing almost instant flow of information to industry and to military customers, DISC is set to meet the challenge of providing the Armed Forces with their industrial supply needs to keep military equipment combat ready.

Air Force Materials Laboratory

(continued from page 9)

- Grumman Aircraft has flown an A–6A Intruder with a boron-epoxy composite skinned outer wing fence. The part has accumulated about 10 hours flight time.
- Northrop is flying an F–5 with an access door made of boron-epoxy. This part has 24 hours flight time, about 12 percent supersonic. Northrop has also successfully flight tested a filament wound graphite yarn reinforced epoxy wing tip leading edge section on the F–5A aircraft.
- North American/Columbus Division is flying an RA–5C with two wing leading edge panels made from boron-epoxy. These specimens have approximately 36 hours flight time.
- Lockheed is flying an L–200 (commercial version of the C–141) with a boron-epoxy curved wing tip panel. It has accumulated 40 hours flight time.

These articles are gathering valuable flight environmental information, such as rain erosion, foreign object damage, etc., and employ a variety of surface coatings. To date, there has been no evidence of degradation in any of the specimens.

Many independent research and development efforts have been stimulated and encouraged by AFML through coordinated planning, continuing technical interchange and guidance, and the provision of gratis filament. The latter item is most important to ensure industry use of the highest quality, reproducible reinforcement supplied to Air Force specifications.

More structural parts development efforts have been accomplished with boron fiber composites than with graphite fibers because boron fibers were available in quantity several years before graphite fibers. However, extensive work is now underway in industry (AFML-sponsored and through independent research and development) on graphite fiber composite structural parts, and progress and results are quite encouraging.

There has been continued growth and interest in composite technology, and a high level of maturity has been achieved in a relatively short development period. Independent research and development efforts have served the very important function of putting industry activity on a learning curve. These efforts have broadened industry experience, increased confidence in the use of advanced composites, and elevated a broad cross section of industry to the current technological level. The technology base has been expanded in areas such as emerging composite materials, fabrication techniques, composite design philosophies, and mechanics of composites.

As with all new technologies, many problems are yet to be solved. These include high confidence complex structural design; conceptual design; fabrication reliability, producibility and inspectability; and cost effectiveness. It is certainly reasonable to anticipate that these problems will diminish as the technological momentum increases. There is absolutely no doubt that continued vigorous development will herald the increasing use of advanced composite structures in the 1970s, and will result in truly significant performance improvements in a broad range of weapon systems.

Gamma-Ray Device Studied To Simulate Bullet Penetration

The Air Force is investigating the use of a gamma-ray device to simulate bullet penetrations into aircraft and equipment. The experiments are being conducted by Cornell Aeronautical Laboratory, Buffalo, N.Y., under the direction of the Air Force Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio. George Ducker is the laboratory's project engineer.

Cornell will build and evaluate a gamma-ray device for use in determining if the non-destructive testing method can be used to assess bullet protection provided by aircraft structures and components. The assessment of an aircraft's natural, or indigenous, protection is necessary to provide for correct amounts of and locations for armor.

Currently, the Air Force is using actual gunfire to determine structural integrity. This method, however, usually destroys the test item and is often difficult to evaluate.

Cornell engineers will measure the degree of gamma-ray attenuation provided by structural elements, and try to establish a correlation between ballistic stopping power and attenuation. The gamma-ray device will operate somewhat like an X-ray machine, with an emitting source and detectors. The source would emit a specific number of particles per second, beamed at the area to be tested. Detectors inside the aircraft would record the number of particles per second penetrating the aircraft. The difference between the count of unobstructed and obstructed rays may indicate the degree of bullet protection at that point of the aircraft's structure.

Cornell scientists are also interested in the existence of radioactive or other undesirable side effects produced by the device.

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Organizations registered for service may obtain microfiche copies of these documents without charge from:

Defense Documentation Center
Cameron Station
Alexandria, Va. 22314

All organizations may purchase microfiche copies (65¢) or full-size copies ($3) of the documents (unless otherwise indicated) from:

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Contractor Proposal Evaluation Process Defined by AMC

Victor Garvis

During the past decade the Department of Army has increased its dependency upon the creativity, talent and resources of the industrial community for the development of new, advanced weapon systems for its highly specialized forces. Industry has responded to this urgent requirement and has expanded extensively. As a result, numerous elements of industry depend upon defense weapon systems development contracts for continuing support.

The Army Materiel Command (AMC), in its role of logistics and materiel supplier for the Army, must evaluate these developmental proposals emanating from the industrial community to ensure that they represent the greatest potential in the best interest of national defense. Today, this evaluation process has become known as "proposal evaluation and source selection."

Proposal evaluation and source selection is not a new and unique process. In the past, with limited reliance upon industrial resources, evaluation procedures could be developed and "tailor-made" for each procurement. With increased industrial participation in the design and development phases, a more systematic evaluation process was instituted.

AMC headquarters has developed, with guidance from the Defense Department and Department of the Army, a systematic technique for such a proposal evaluation process. This technique provides assurance to both the Army and the industrial community that proposals are judged with objectivity, competency and integrity.

It includes a scoring and evaluation method which can be described as a structure or process with pyramid capabilities for downward segmentation to successively lower levels to any desired evaluation dimension. Inherent in any pyramid type process is the capability for summarization to each successively higher level. Figure 1 depicts a typical example of an evaluation pyramid.

Evaluation Organization

Top management establishes overall direction and control policies for the proposal evaluation cycle; however, these policies do not guarantee effectiveness in the completion of an evaluation process. The effectiveness of the evaluation process is dependent upon the organizational arrangements within the basic policy framework, and the talent, experience and professional competency of the personnel selected.

The scoring and evaluation procedure is designed with organizational flexibility for:

- Assembling large groups for evaluating extensive detail for major and complex weapon systems or research projects.
- Convening compact groups for short durations for weapon systems or research projects of lesser significance.

In determining the organizational stratification and size, numerous aspects must be considered. Considerations include:

- Anticipated size of the contractor's proposal in response to the request for proposal (RFP).
- Level and complexity of information required from contractors as directed by the RFP.
- Number of evaluation statements assembled to evaluate the meaningful aspects of the proposals.
- Complexity and size of the weapon system, study, or end product.

The basic evaluation organization or board, regardless of size, is structured based upon the textual arrangement and design of the RFP. A chairman and his staff direct the efforts of the organization in the accomplishment of the evaluation tasks. The second level of the evaluation organization is composed of groups compatible with the major sections of the RFP, *e.g.*, technical management and cost areas are logical sections of the RFP, consequently a group could be established for each of these areas (Level 2, Figure 1). Groups are composed of committees. The committees are, as at the second level, identified with smaller segments of the RFP,

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e.g., the technical group can be segmented into a vehicle committee and a propulsion committee, etc. Actual evaluation can be performed by individuals at the committee level, however, subcommittees or sub-subcommittees can be established for more complex systems.

The textual arrangement of the RFP establishes the format for the contractor's proposal and, subsequently, the structural arrangement of the evaluation organization. However, such areas within the RFP, and consequently the proposals, cannot be refined to the extent that overlap is eliminated. For example, certain aspects of management have technical properties and vice versa, such as:

- Analog computer capabilities for engineering design.
- Adequacy of research and development facilities.
- Time, cost and technical performance tradeoffs and impact.

Because of potential overlap between areas, it is advantageous to provide for a degree of talent and experience interchange between areas. For example, some members of the management group could not only be technically oriented, but also possess knowledge of management principles and practices or have experience as operating managers. Individuals with this aptitude and experience, although assigned to the management group, would also provide necessary technical knowledge for complete assessment of other areas with which they have technical capability for analysis.

The success of the proposal evaluation and source selection mission is dependent largely upon the caliber of individuals selected to serve as evaluators; consequently, extreme care is exercised in their selection. Critical factors in their selection are talent; professional accomplishments; specialized, related, or compatible experience; personal integrity and reputation; and ability to exercise good judgment and properly appraise all items of information. After selection, assignment to the evaluation group is a delicate process. It is delicate because individuals with these qualifications are frequently key individuals within their own organizations. As a result, they are frequently selected by name, and the necessary authority is cited to effect the assignment.

Upon convening the evaluation organization, it is imperative that management relieve members of all other tasks other than the evaluation. Individuals, while performing the evaluation tasks, cannot be "plagued" by secondary responsibility or home office problems. Individual performance requires special diligent attention to countless words of information within a critical time frame with no leniency in the toleration for error.

Evaluation Criteria

As shown in Figure 1, the foundation for the scoring and evaluation method is the evaluation criteria. The evaluation criteria divide the RFP into workable-sized units in accordance with the basic outline provided in the RFP. These units are in the form of evaluation statements or questions that channel the proposal review directly to specific items or areas. In the development of the evaluation statements, caution must be exercised to ensure that they relate only to the specific requirements of the RFP. As shown in Figure 1, a typical evaluation statement is "sequential logic of network events" or

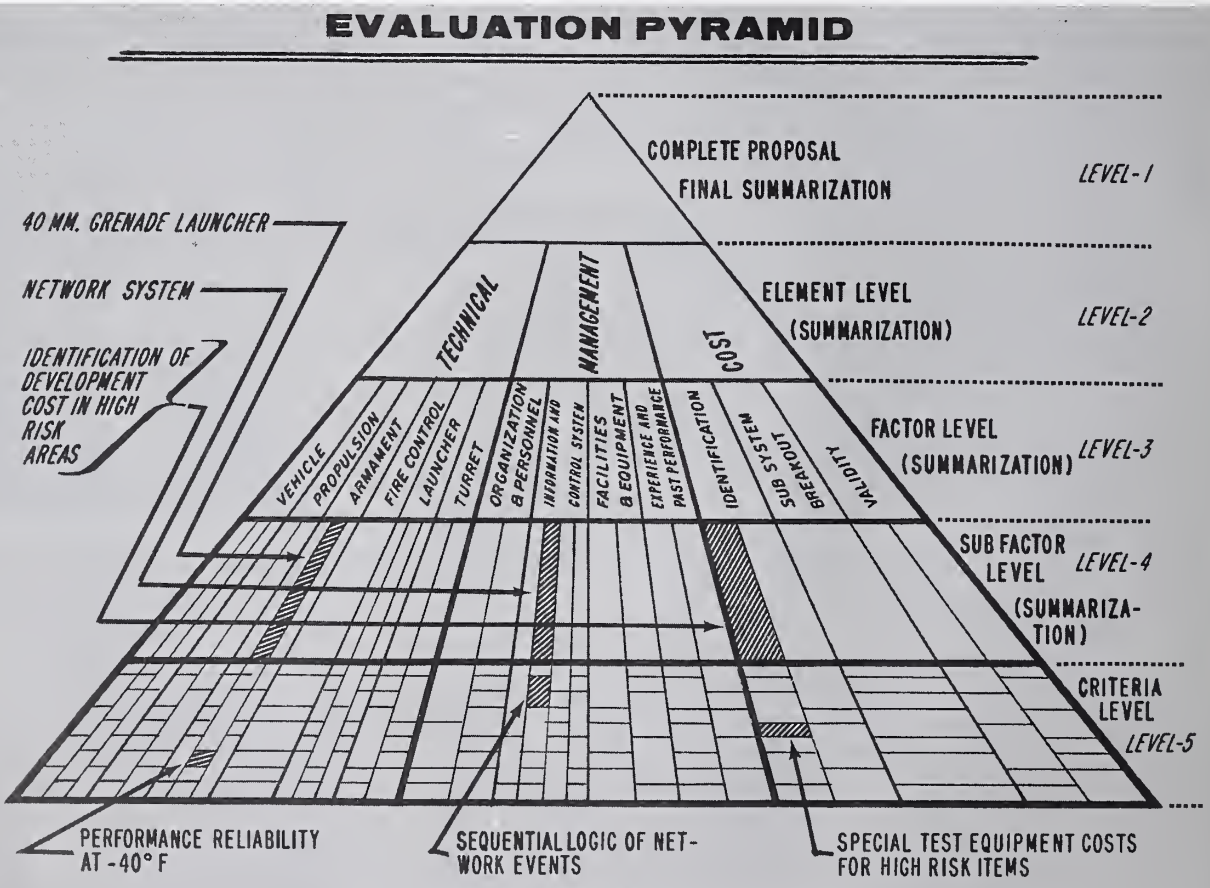

Figure 1.

"special test equipment cost for high risk areas." Any number of evaluation statements can be utilized in the formulation of the evaluation criteria. For example, considerably more statements may be required to assess the weapon system characteristics and potential than would be required to determine the company's management experience and capabilities. The number is dependent upon the impact, emphasis, or complexity of the element, factor, or subfactor.

The evaluation criteria are developed prior to the receipt of the proposals from the contractor. In fact, it is advantageous to develop the evaluation criteria prior to final preparation of the RFP. The development of a criteria at this time serves to "test" the RFP to determine if all requirements are logical and conducive to sound responses from the contractor. Upon the receipt of the proposals from the contractor, the criteria are "locked in" and modifications are not allowed.

Scoring

The evaluation method used includes a scoring system to rate the merit of each proposal. Proposals are reviewed in depth against the statements in the evaluation criteria, and the contractor's response is scored for the degree of excellence related to the evaluation statement. Individual scores produced by the evaluator at this level are classified as "basic" or "raw" scores.

Prior to scoring by individuals, a scoring guide is developed. The purpose of a scoring guide is to unify the evaluator's concepts as to the degree of merit that can be related to each point score.

A typical or sample scoring guide is:

10 Outstanding: A comprehensive and extensive response in depth and displaying a very high degree of capability in a respective area.

9 Superior: An extensive and detailed response to all requirements and displaying high-level capability in a respective area.

8 Excellent: A response with clear definable detailed information for all major positions of requirement, and with a strong capability in excess of the basic requirement.

7 Very Good: A response with detailed information and recognized capability in excess of minimum requirements in a respective area.

6 Good: A response with limited detail and capability in excess of the minimum requirement in a respective area.

5 Adequate: A response complying with the established requirements and with acceptable capability in a respective area.

4 Weak: Lack of clarity in a response or vague indications that a capability exists.

3 Poor: Omission of minor details —omissions or misunderstandings of requirements in a minor area of capability not defined.

2 Very Poor: Omission of major details and facts—omission of major requirements or misunderstandings of major requirements in a respective area.

1 Inadequate: Gross omissions or failure to respond to a major requirement.

0 Nonresponsive: Failure to submit data in a given area.

Two ranges of scores are normally acceptable: the 0 and 10 range or the 0 to 100 range. The 0 to 10 range is preferable as the excellence of a proposal is difficult to segment to the hundredth degree.

Scoring by evaluators is accomplished on an individual basis, independent of other evaluators assigned to the same criteria. Prior to actual scoring of proposals, there is frequently a necessity for interchange of ideas between evaluators relative to the meaning or intent of the information contained in the proposal. However, once the information exchange is completed the scoring is performed individually and the basic scores submitted are individual scores—not a composite score reached by several committee members. Under *no circumstances* are original basic scores assigned by an evaluator modified by any other individual. Where there are questions concerning the original basic score, it is brought to the attention of the evaluator that assigned the score. If the original evaluator considers that the score was recorded erroneously, *he alone can make the correction.* Each individual score is supported by a narrative justification. The narrative justification outlines the strong points, weak points, and general comments of the proposal relative to the individual evaluation statement. Narrative justifications may vary in length from two to three sentences to several pages.

Weighting

All contractor proposal evaluation techniques, particularly those for

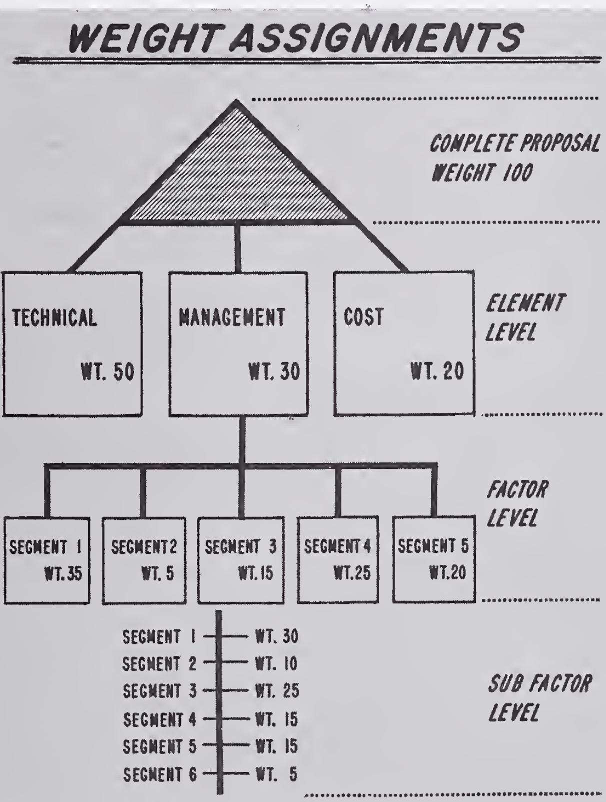

Figure 2.

complex weapon systems, require that increased emphasis be given to priority areas. An integral part of this technique is the capability for providing such increased emphasis, where required. The method for directing this emphasis is through the assignment of weights by percentage distribution to priority areas of emphasis, based upon 100 percent for the complete proposal. Within each of the priority areas, segments can be emphasized or de-emphasized by the same weighting or percentage distribution. Weights can be assigned to all levels of the evaluation pyramid and to all segments at each level with limitations. Figure 2 illustrates such a hypothetical pyramid with sample weights assigned.

Experience has shown that assignment of weights to the individual evaluation statements at the criteria level is of limited value. This is generally the level directly below the subfactor level as illustrated in Figure 2. The weighting of individual evaluation statements increases extensively the arithmetic computation necessary for summarization. An alternate method, at the statement level, for directing the desired emphasis is to increase the number of statements relative to the areas of importance.

Weight information is not disclosed to the evluation groups until all scores have been assigned and narrative justifications have been completed.

Contractor proposal evaluation and source selection is a difficult process that demands cautious attention to organization and evaluation planning, and tedious and diligent proposal review. The technique employed by AMC has the capability for proposal segmentation to any detail and summarization from any level. It also has the flexibility for use on small or large hardware systems, of varied description and research, or non-hardware study efforts.

Army Seeks Safer Fuels

A new dimension in crew survivability may be added to all Army air, sea and land craft under a requirement for "safe fuels" proposed by the Army Combat Developments Command (CDC), Fort Belvoir, Va.

Several general approaches are being considered in the program to reduce the threat of fuel fires from crash impact, mines and small arms fire. Laboratory tests have shown the feasability of burning gelled and emulsified fuel in gas turbine engines.

The gelled fuel, with a consistency of gelatin, is made by adding a 2-percent solution of alkylamide to the fuel. In shock of impact, the gelled fuel is scattered in relatively low volatile globules.

Emulsified fuel is made by adding a gelled chemical solution containing approximately 3 percent water to the fuel. On impact, emulsified fuel reverts to a thickened state, reducing the hazard of fire.

A third possibility is visco-elastic additives, which alter or delay initial fuel spurt patterns when the gas tank is punctured or penetrated.

The CDC proposal requires that the fuel must provide for operation without power loss, and must retain ease of handling within a temperature range of –65 to 145 degrees F. The "safe fuel" must also be compatible with current and foreseeable fuel system materials. New techniques will be needed, however, for filtration, tankage, storage, transfer and field delivery.

Army Foresees Electronic Surveying by 1975

Army survey teams of 1975 will use wheels and helicopters instead of feet under a new proposal by the Combat Developments Command (CDC), Fort Belvoir, Va.

The proposal calls for an electronic position and azimuth determining system (PADS) .that will provide the three dimensional coordinates, north, east and elevation, plus directional readings. PADS would be adaptable to both standard military trucks and helicopters, consequently eliminating many of the restrictions of present-day line of sight transit and steel tape survey operations.

According to the Army, PADS would have impact on almost every aspect of combat operations. Field artillery would be able to "fire for effect" from a predetermined point without adjusting rounds. Engineer, mobile air defense, infantry maneuver, and inland waterway operations would also profit from PADS' survey control.

PADS is to operate around a north-seeking gyrocompass oriented to earth rotation. It will be unaffected by electromagnetic impulses, including jamming. The gyro will permit initial angle determination using a single reference point.

The CDC proposal calls for accuracy of 10 meters on the grid coordinates, 5 meters on height data, and 1/10 of a mil (about 1/17 of a degree) directionally.

Air Force Art Series Available

A series of 48 full-color lithographs, depicting the U.S. Air Force through photographs and paintings, is available in sets of 12 from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. The selections, all 17-by-22 inches, are $2 per set. The sets, order numbers, and subjects are:

Set 1 (D301.76:1): Thunderbirds; Thirsty Phantom; In-Flight Refueling; 200th Minuteman II ICBM Blasts Off; F–100 Super Sabres; U.S. Air Force Academy; T–38 Talon; C–130 Hercules; C–123 Provider; Titan IIIC Booster; F–111A; B–52 Stratofortress.

Set 2 (D301.76:2): Colonel "Mac's" Phantom; Air Support; Over Saigon Harbor; Perimeter Guard; Message For Hanoi; Convoy Cover Highway 19, Vietnam; Ready For Takeoff; Dragonship; Home With The Wounded; Aerovac Nurse; Thunderchief Crew; Mercy Mission.

Set 3 (D301.76:3): C–141 Flying Hospital; Forecast With A Smile; Air Force Sentinels Of Freedom; Ready Now—Air Force Reserve; Aerial Combat Cameraman; C–5 Galaxy—Maiden Flight; C–141 Preflight; Apollo Spacecraft Homeward Bound; Photo of the Month Jan. 68—AAVS; HC–130P—Fulton Recovery System; Skyraiders Escort HC—130P and HH–3E; C–130—Operation Deep Freeze.

Set 4 (D301.76:4): Arctic Radar —Thule BMEWS;Voodoo Launches a Genie; Friendly—B–57 Canberra; F–101 Voodoo; Mission Completed; F–104 Starfighters; ADC Space Trackers; F–104 Starfighter; F–106s Over Mount Ranier; ADC Control Center; Bomarc on Alert; Aerospace Defense Command Pilot.

Total Compensation Evaluation Goal of DOD Program

Colonel Edward H. Robertson, USAF

To incorporate the requirements for review of a contractor's compensation structure into its assigned function, the Defense Contract Administration Services (DCAS) of the Defense Supply Agency recently established a Compensation System Review (CSR) Program. This program is unique. For the first time within the Defense Department, an attempt is being made to evaluate total compensation, thereby eliminating piecemeal reviews of the various compensation parts. Total compensation consists of wages/salaries and incentive compensation (fringe benefits) as indicated in the Armed Services Procurement Regulation (ASPR), paragraph 15–205.

The need for this program grew out of concerns in the Congress and in the Executive Branch over employee compensation paid under government contracts. In July 1961, President Kennedy directed that an interagency study of research and development contracting practices be undertaken. The resulting report to the President on Government Contracting for Research and Development (commonly known as The Bell Report) was approved on April 30, 1962. It recognized that "there has been a great deal of concern over the salaries and related benefits received by personnel employed on federally financed research and development work in private institutions." Particular emphasis was placed on persons employed in "not-for-profit" establishments doing work exclusively for the Government.

Since that initial study, there have been other reviews of employee compensation conducted by the Bureau of the Budget, the ASPR/Contract Administration Panel, and the General Accounting Office. These studies indicated a need for more uniformity within DOD in the review and approval of employee compensation.

Guideposts Set by Council of Economic Advisers

At this point, it should be stressed that the CSR program is not an attempt to inject a concept of wage controls into DCAS contract administration responsibilities. The only concern is reasonableness of costs to the Government. In its 1968 report to the President, the Council of Economic Advisers stated emphatically that the least desirable method of stabilizing prices was direct controls. Excerpts from this report, contained in the Bureau of National Affairs, Inc., "1968 Briefing Sessions on Collective Bargaining Workbook," enunciate significant concepts. For example, the Council of Economic Advisers stated this overall objective of reasonableness of price:

> **The magnitude of the stakes involved in moving promptly toward restoration of reasonable price stability is abundantly clear. It is equally evident that the steps taken to achieve this objective must not impair our other essential goals: maintaining high employment; preserving the effectiveness of free markets in allocating productive resources; and encouraging efficiency and minimizing waste.**
>
> **The various policies available to improve price stability must be evaluated in the light of these goals.**

The council's guideposts, first presented in January 1962, represent a form of income policy for the United States. The guideposts do not merely appeal for general restraint but, in addition, try to provide guidance to individual unions and firms as to the specific behavior of wages and prices which would be consistent with general price stability, as well as with efficient allocation of resources. The 1968 Council of Economic Advisers reviewed the genesis, objectives and principles of the guideposts in detail. In their simplest form, the guideposts rest on three basic propositions as stated in the council's report:

> **1. While changes in wage rates in any particular year reflect special conditions in specific segments of the labor market, they tend to be broadly similar throughout the economy. Existing wage differentials largely reflect a whole set of institutional factors and basic differ-**

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ences in skill requirements or other attributes of the job, and it is reasonable that they should change rather slowly.

2. Price changes in any industry or sector are strongly influenced by unit labor costs and also reflect the influence of the value of capital used per unit of output and the prices for materials and services purchased from other industries. *For the economy as a whole, the influence of purchased materials and services essentially cancels out, so that prices depend largely on wages and returns to capital—profits, interest and depreciation.* If prices move in proportion to unit labor costs, the relative shares of wages and returns to capital will remain constant. Moreover, since the capital employed per unit of output shows little trend in most sectors, the rate of return on capital will remain stable. [Emphasis added.]

3. Simple arithmetic requires that, for the average of unit labor costs in the entire economy to be stable, it is necessary that the average change in hourly compensation match, as a percentage, the average change in output per man-hour in the entire economy; and, for the average of prices to be stable, the movements of prices should conform to the movements of unit labor costs.

In defending the first two of these propositions, the Council has frequently asserted not only that they reflect the ways in which wages and prices "ought" to behave, but that they basically reflect the way in which wages and prices tend, in the long run, to behave under free-market conditions.

Other Concerns Pointed to Need for CSR

There were other considerations which motivated implementation of the DCAS total compensation review program. One concern was the ever-increasing compensation costs included in the total price to the Government for purchases of goods and services. Total compensation costs for both the public and private sectors of the national economy are depicted in the 1967 analysis of the Gross National Product (GNP) and the Gross National Expenditure (GNE) by the Department of Commerce. The 1967 GNP was $790 billion, and the GNE for compensation of employees was $468 billion, or almost 60 percent of the GNP. This same analysis identified *total* 1967 National Defense Expenditure for goods and services in the amount of $72 billion. Application of the 60 percent ratio indicates that $43 billion of this total was expended for compensation of employees. Costs of this magnitude require close scrutiny prior to contractual awards.

Another concern is the impact that DOD procurements make on the national economy in the form of contributions to wage spirals as the result of competitions for labor talents. For example, DOD and defense-oriented contractors employ, on a percentage basis, more engineers and scientists than private industry sectors. In 1967, Congress and the President took steps to achieve comparability of salaries between Federal and private employment, a goal set by the Salary Reform Bill of 1962. It appears axiomatic that the private sector will react to government competition for skills by offering additional attractions in the form of increased wages, salaries and/or fringe benefits.

DOD requirements also impact the number of workers employed in the private sector, both directly and indirectly. For example, the September 1967 issue of the "Monthly Labor Review," published by the Bureau of Labor Statistics, U.S. Department of Labor, indicated that 73,000 jobs were supported in FY 1967 for each billion dollars of defense purchases from the private sector. Employment attributable to military expenditures includes both the direct employment necessary to produce the final goods and services purchased, and the indirect employment required in all levels of supporting industries which provide materials, components, transportation, and distribution services ultimately embodied in the final purchase. Indirect employment is further affected by income multiplier or accelerator effects which induce further compensation and investment purchases.

The January 1968 issue of *Business Management* contained an informative article on "Executive Compensation" for 1968, which reinforces the DCAS concept of total compensation. Some pertinent excerpts are cited from this article:

a. Salary alone provided limited insight into what senior management persons earn these days.

b. American business is aware that salary, by itself, is not a true measure of a senior executive's worth, nor appropriate compensation for him. In other words, by adding a bonus and a capital pay program to salary, business shows that it is taking what might be called a total compensation approach to the subject of management pay.

c. Why is the chief executive's salary the correct starting place in evaluating compensation? For these reasons:

(1) The top executive's salary is the yardstick by which all other salaries are set.

(2) If the top salary is not in line, a corporation's other compensation-bonus payments, option payments, pensions, and other forms of compensation may present problems.

(3) If the top salary is lower than it should be, there's a tendency to compress other salaries in the company—an open invitation for competitors to move in and lure key men away with more attractive offers.

(4) If the top man's compensation is too high, a company runs the risk of stockholder and union criticism or unwelcome attentions from Government agencies.

(5) The chief executive's salary also is the most conspicuous and obvious. If it fails to reflect the stated corporate purposes and policies, a credibility gap is created that could damage morale.

Another consideration is DOD's concern that the reasonableness of overhead costs be validated. Ensuring contractor surveillance and control of indirect manpower portions of overhead costs is an important part of the CSR Program, and we plan to inject this consideration into our reviews. We believe evaluaton of contractor surveillance and control of indirect manpower is a logical consideration in the determination of reasonableness of costs produced by the contractor's compensation system.

Approach to Program Establishment

Based on the foregoing, we determined that a systems approach to reviewing a contractor's total compensation (as identified in ASPR 15–205.6) is a necessary and desirable method for determining the acceptability of a contractor's employee compensation program. This conclusion resulted in the establishment of the CSR Program. While all elements of costs are subjects of concern, compensation for personal services is especially important, as it is one of the larger items of costs incurred under government contracts. The ASPR recognizes this importance by assigning to the administrative contracting officer the responsibility for determining that a contractor's total compensation policies, practices, and compensation structure conform with sound business practices, and that compensation costs resulting therefrom meet the test of reasonableness required by ASPR 15–205.6.

To date, a nation-wide CSR pilot test has been completed, the results have been evaluated, and a guide for conducting CSRs has been compiled. This guide will eventually become the CSR Manual. One result of the CSR pilot test was confirmation of the acceptability of utilizing the DCAS technical team concept in performing CSRs. This technique has proven successful in other systems reviews performed by this agency, and is considered a cornerstone in our evaluations of contractor financial systems.

The CSR Program is primarily concerned with the total compensation package of wages and salaries, and incentive compensation (fringe benefits) of contractors with anticipated annual negotiated government sales of $15 million or more. However, the flexibility of the CSR Program also allows for other selective reviews depending on the significance of the compensation costs being charged to the Government. We believe this approach marries the requirement for surveillance with the DOD intent to relax contractor controls, wherever possible. To this end, we have eliminated (except in special instances) the need for approval, on an individual contract basis, of individual annual salaries in excess of $25,000, contractor classification systems, incentive compensation plans, and other plans providing fringe benefits and allowances.

Role of DCAS Regions

Acceptance by DCAS of the compensation system includes acceptance of the foregoing parts of the system. This acceptance continues until the contractor changes his compensation system or technicians of the cognizant DCAS region indicate that improper application of the compensation system is producing unreasonable costs to the Government. This concept of relaxation of controls is also a part of the follow-up portion of the CSR Program. The need and frequency for continued surveillance of a contractor's compensation system is determined on an individual contractor basis, rather than by incorporating a mandatory annual review requirement into the program.

The CSR Program is implemented at the DCAS region level. Administrative contracting officers determine which contractors meet CSR criteria. These criteria apply to:

- Contractors with $15 million or more of anticipated annual government negotiated sales, provided the contractor is not qualified under the provisions of ASPR 3–1000, Contractor's Weighted Average Share in Cost Risk.
- "Not-for-profit" contractors who, generally, will be scientific organizations engaged in scientific research for the benefit of the general public. Patents, copyrights, processes, and formula information resulting from scientific research must be made available to the public. The corporate charters of not-for-profit contractors will normally contain this concept.
- Other reviews as necessary due to unusual extenuating circumstances.

After completion of the initial CSR, the frequency of subsequent reviews or follow-up actions depends on the initial CSR report recommendations, significant changes to a contractor's compensation system, or indications from operating personnel (contract auditor, administrative contracting officer, price analyst, etc.) that the contractor is not conducting his compensation system in keeping with approved policies and procedures.

ASPR 1–406(i) cites the contract administration function of reviewing a contractor's compensation structure. One prerequisite for accepting a contractor's compensation system is the determination that the system will produce reasonable costs under government contracts. This consideration is influenced by the contractor's control and evaluation of his manpower requirements, as well as by the acceptability of his compensation system. Compensation is reasonable to the extent that the total amount paid or accrued is commensurate with compensation paid under the contractor's established policy and conforms generally with compensation paid by other firms of the same size, in the same industry, or in the same geographic area for similar services. A determination should also be made that such compensation is reasonable in relation to the actual personal services required.

The results of CSRs are summarized in reports furnished to cognizant administrative contracting officers and procurement contracting officers who have significant procurement interest in the contract. These officials use the reports as bases for performing checks they deem necessary to make decisions as to the acceptability of compensation costs.

The objective of the CSR approach to reviewing contractor compensation systems is not only to satisfy ASPR requirements. The objective is also to provide an effective management tool which permits DCAS accomplishment of contract administration in an orderly, intelligent manner.

Army Engineers Announce New R&D Office

The Chief of Army Engineers has established a Research and Development Office to provide program management services for all U.S. Army Corps of Engineers research and development missions.

The expanding research and development programs of the Engineers, which now averages over $30 million annually, embraces research in basic constructions, military engineering, topography and geodesy, nuclear power applications, arctic environment, and water resources development.

The new office will have a small staff to provide central managment support for the Engineers' research programs. The staff will also review the research activities of the Corps' field activities and laboratories, recommending new work assignments, workload redistribution, and future facility requirements.

Robert F. Jackson, who has been named Deputy Chief, is currently serving as Acting Chief of the office.

Army Avionics

(continued from page 3)

cargo handling, refueling, and ordnance handling. The buildup of charge is due both to triboelectric charging and to the earth's field. Charging rates of a few microamperes and earth field gradients of 100 volts per meter are considered normal. However, charging rates in excess of 100 microamperes in snow and sand-dust environments, and earth field gradients of approximately 5,000 volts per meter in disturbed weather, can result in extremely high potentials (–200,000 to +60,000 volts, by actual measurement) depending upon the aircraft type and the existing environmental conditions. These high static potentials cause uncontrolled corona discharges which, in turn, can cause radio frequency interference (RFI). There also exists the possibility of high instantaneous energy transfer upon contact with ground handling personnel. Investigations and tests of present passive and active electrostatic discharges indicate possible solutions to some of these problems. For example, the application of the wing-mounted trailing edge fixed wing precipitation electricity dischargers, or P-STATS, to rotor blades is a current approach to the problem. Further advancements in the development of other passive and/or active electrostatic dischargers to minimize RFI and personnel safety hazards can provide significant improvements.

Tactical Usage.

Tactical usage of Army helicopters to date, and those anticipated in near-term aircraft systems development programs, emphasize the need for significant improvements in extremely low altitude operations, formation flight, and group landing under IFR conditions. The operational uses impose severe requirements on the pilot, avionics technology, and the systematic integration and use of this technology.

Future avionics systems must stress a reliable, systematic design approach to the man-machine interface, crew tasks throughout the flight profile (pre-flight, takeoff, enroute, mission accomplishment and approach and landing), optimized displays, efficient computation and data processing, and multipurpose sensors. The systems concept must be man-centered from its inception, mission oriented, and integrated to a degree commensurate with the then current state of the art and mission requirements. Extensive application of man-in-the-loop simulation will be utilized by the Government during system syntheses, and should be considered by potential prime systems contractors to assure accomplishment of these goals.

Defense Personnel Support Center

(continued from page 6)

ter achieved an effective interchange of knowledge between the seller and user. Annual forecasts, showing projected quarterly increments, were provided industry as early as possible.

Lessons Learned from the Past

The foregoing has reviewed the type of emergency problems that have confronted DPSC and its industrial suppliers in the past. How do we at the center view the future? With cautious optimism is the answer. Many lessons have been learned from the major supply crisis of the Southeast Asia situation.

We realize the need for adequate inventories to preclude "crisis" procurements. Such inventories are essential in all commodities procured by DPSC, especially those which require a procurement lead time of six to nine months.

We have learned that even when adequate production is available, as in the case of food items, an urgent need exists for adequate transportation means, especially in the reefer type of conveyance.

We realize that industry is the main support of the Government in time of crisis. A continuing management goal is to achieve improved coordination and cooperation between DPSC and its industry contractors, and we will welcome suggestions from industry for methods that will forestall the "crisis" problems of the past.

Above all, we have learned that, in any national emergency, the combined dedication of industry and DPSC is vital in keeping our Armed Forces adequately supplied with medical materiel, food and clothing.

Contractor Response to Questionnaires

The Defense Department has received several inquiries from contractors concerning a questionnaire, prepared by a new publication, soliciting detailed information concerning defense systems under research, development, or production.

Response to any such questionnaires is governed by paragraph 5n of the Industrial Security Manual (ISM) for Safeguarding Classified Information (Attachment to DD Form 441) which requires clearance of information pertaining to classified contracts. Such clearance is a prudent safeguard against the inadvertent disclosure of information harmful to national defense.

In instances where the provisions of paragraph 5n of the ISM may be inapplicable, the Department of Defense Industrial Security Regulation counsels as a matter of prudence and sound judgment—"When in doubt, or in need of advice, in the exercise of their discretion in this matter, contractors may seek guidance from their cognizant security office."

DSA Will Procure Electronic Items for All Federal Agencies

The Defense Supply Agency (DSA), Alexandria, Va., is assuming responsibility for supply support and procurement of electronic items used by civil agencies of the Federal Government in a two-phase transfer. By September, responsibility for support of the civil agencies, and items of common use by both civil and military agencies will have been transferred from the General Services Administration to DSA. On March 1, 1970, responsibility for non-common items on a selective basis will be transferred.

DSA currently provides all the Military Services, and some civil agencies on a selected basis, with electronic items. Procurement is handled through the Defense Electronics Supply Center, Dayton, Ohio.

Congress To Get Progress Reports On Weapons Acquisition

The first of a new series of weapon systems status reports were furnished to the Senate Armed Services Committee by Secretary of Defense Melvin R. Laird on June 20. This was the initial group in a series of classified reports to the Senate Committee, entitled "Selected Acquisition Reports," indicating current estimates for various aspects of the systems, including technical objectives and costs.

The reports are one facet of improved and strengthened procedures instituted by Secretary Laird to monitor and control cost and technical progress of major weapon systems and to keep the House and Senate Armed Services and Appropriations Committees currently informed.

In addition to these reports, which will be reviewed and monitored by the Service Secretaries and the Secretary of Defense, a Defense Systems Acquisition Review Council has been established. Composed of the Director of Defense Research and Engineering, and the Assistant Secretaries of Defense (Installations and Logistics), (Comptroller), and (Systems Analysis), the council will review and make recommendations to the Secretary of Defense on all major weapon systems, including decisions to proceed with system development, contract definition and production.

Through these, and other strengthened procedures, continuing review and control over all major weapon systems will be maintained.

In the initial group of 12 acquisition reports, 9 showed a cost growth from the original program plan for the systems totaling approximately $3.5 billion. The percentage of increase above original cost estimates varied between the systems from less than 1 percent to 194 percent (Figure 1).

The predominant reasons for the cost growth, as stated in the nine reports, are (dollar amounts in billions):

Optimistic original cost estimates	$1.4
Unforseen development and production problems	0.8
Escalation of labor and material costs	0.9
Configuration changes to resolve technical difficulties	0.4

The original estimates for the systems with cost growth were made from 1965 through 1968. Many of the systems have been in production or research for several years; therefore, a portion of the cost growth totaling approximately $1.3 billion already has been included in approved Defense Department budgets through FY 1969, and in the FY 1970 budget request now under review by the Congress. To the extent of this amount of $1.3 billion, the Congress already has been advised of the cost growth experienced and has previously approved the additional funding required through FY 1969.

Both the systems covered in the first reports and other major systems are currently undergoing further intensive review by the Secretary of Defense. Specific decisions will be made in each instance in which additional funding to cover cost growth might be required. Program adjustments will be made if appropriate, consistent with essential defense needs.

The following is the list of the 31 weapon systems on which the Senate Armed Services Committee had asked for regular reports:

Army: General Sheridan armored reconnaissance tank; Cheyenne armed helicopter; Shillelagh anti-tank missile; Lance missile; Safeguard anti-ballistic missile.

Navy: Attack submarine (SSN–688 class); DX destroyer; Nuclear powered attack carriers (CVAN–68, –69); Landing Helicopter Assault ship (LHA); Nuclear guided missile frigate (DXGN); Poseidon; Phoenix missile; Sparrow missile; Walleye bomb; F–14A fighter; P–3C patrol aircraft; A–7E attack plane; S–3 anti-submarine warfare plane (VSX); MK–48 torpedo; Condor missile.

Air Force: SRAM missile; Maverick missile; Minuteman II and III ICBMs; F–111; C–5A; A–7D; Airborne Warning and Control System (AWACS); AMSA bomber; F–15 fighter; Manned Orbiting Laboratory (MOL).

Additional systems are expected to be included in the new reporting system, reported Secretary Laird.

Cost Growth for Nine* Weapon Systems

($ millions)

	Date of Original Estimate	Total Cost Growth	Amount Funded Thru FY 1970
Lance	Dec 67	$ 20.0	$ 12.2
CVAN '68	Sept 65	108.4	108.4
DX	Nov 67	644.7	129.0
LHA	Dec 66	389.5	140.0
P3C	Sept 67	4.7	4.7
C5A	Oct 65	1,363.0	248.0
SRAM	Sept 65	313.9	273.9
RF–111	Mar 68	216.2	—
FB–111	Feb 66	407.5	391.2
		$3,467.9	$1,307.4

*Of the initial group of 12 systems on which reports went to the Senate Armed Services Committee no cost growth was identified in Safeguard, CVAN '69 and DXGN

Figure 1.

MEETINGS AND SYMPOSIA

AUGUST

Sixteenth National Armed Forces Management Association Conference, "Technology and Management—The Modern Partnership," August 19-21, Washington Hilton Hotel. Washington, D.C. Sponsor: Armed Forces Management Association. Contact: RAdm. Thomas B. Neblett, USN (Ret.), Armed Forces Management Association, 839 17th St. NW, Washington, D.C. 20006. Phone (202) 659-4500.

Photoelectric and Secondary Electron Emission Conference, August 27–28, University of Minnesota, Minneapolis, Minn. Co-sponsors: Special Devices Group of Advisory Group on Electron Devices, and the University of Minnesota. Contact: Prof. W. T. Peria, Electrical Engineering Department, University of Minnesota, Minneapolis, Minn. 55455.

SEPTEMBER

Turbulence Measurements in Liquids Symposium, Sept. 8–9, University of Missouri, Rolla, Mo. Sponsors: U.S. Army Research Office-Durham, Office of Naval Research, Air Force Office of Scientific Research, and the Advanced Research Projects Agency. Contact: James J. Murray, Engineer, U.S. Army Research Office-Durham, Box CM, Duke Station, Durham, S.C. 27706. Phone (919) 286–2285.

Ordered Alloys: Structural Applications and Physical Metallurgy, Sept. 15–17, Lake George, N.Y. Sponsors: Air Force Materials Laboratory and the Metallurgical Society. Contact: Mr. Poynter, Air Force Materials Laboratory, Wright-Patterson AFB, Ohio 45433. Phone (513) 255–3803.

Twenty-fourth Annual National Defense Transportation Association Forum, "**Transportation-New Horizons.**" Sept. 21–24, Regency Hyatt House, Atlanta, Ga. Sponsor: National Defense Transportation Association. Contact: Gerald W. Collins, National Defense Transportation Association, 1612 K St., NW, Washington, D.C. 20006. Phone (202) DIstrict 7–3530.

Annual Air Force Association Fall Meeting and Aerospace **Development** Briefings, Sept. 22-24, Sheraton-Park Hotel, Washington, D.C. Sponsor: Air Force Association. Contact: Gus Duda, Air Force Association, 1750 Pennsylvania Ave. NW, Washington, D.C. 20006. Phone (202) 298-9123.

Theory and Application of Differential Games International Conference, Sept. 29-Oct. 1, University of Massachusetts, Amherst, Mass. Sponsors: Air Force Office of Scientific Research, American Automatic Control Council, and the Institute of Electrical and Electronics Engineers. Contact: Capt. Allen D. Dayton, Air Force Office of Scientific Research, 1400 Wilson Blvd., Arlington, Va. 2209. Phone (202) OXford 4–5261.

Computers and Communications Conference, Sept. 30–Oct. 2, Rome, N.Y. Sponsor: Mohawk Valley Section, Institute of Electrical and Electronics Engineers. Contact: John M. Harrington, Conference Chairman, 304 E. Chestnut St., Rome, N.Y. 13440. Phone (315) 337–0660.

OCTOBER

Thirteenth Annual **Organic Chemistry** Conference, Oct. 7–8, Natick, Mass. Sponsor: U.S. Army Natick Laboratories, and the National Academy of Sciences—National Research Council Advisory Board on Military Personnel Supplies. Contact: Dr. L. Long Jr., Head, Organic Chemistry Group, PRL, U.S. Army Natick Laboratories, Natick, Mass. 01760. Phone (617) 653–1000, Ext. 2414.

Annual **Association of the United States Army** Meeting, Oct. 13–15, Sheraton-Park Hotel, Washington, D.C. Sponsor: Association of the United States Army. Contact: Brig. Gen. Robert F. Cocklin, USAR, Association of the United States Army, 1529 18th St, NW, Washington, D.C. 20036. Phone (202) 483–1800.

Feeding the Military Man Symposium, Oct. 20–22, U.S. Army Natick Laboratories, Natick, Mass. Sponsor: National Academy of Sciences—National Research Council, U.S. Army Natick Laboratories, and Research and Development Associates, Inc. Contact: Executive Secretary, Research and Development Associates, Inc., Natick Laboratories, Natick, Mass. 01760. Phone (617) 653–4920.

Fifteenth **Design of Experiments in Army Research, Development and** Testing, Oct. 22–24, Redstone Arsenal, Ala. Testing Conference, Oct. 22–24, Redstone Arsenal, Ala. Sponsors: U.S. Army Research Office-Durham, and the Army Mathematics Steering Committee of the Office of the Army Chief of Research and Development. Contact: Dr. Francis G. Dressel, Mathematics Division, U.S. Army Research Office—Durham, Box CM, Duke Station, Durham, S.C. 27706. Phone (919) 286–2285, Ext. 75.

Security Seminar Set for Mid-September

The American Society for Industrial Security will hold its Fifteenth Annual Seminar, "Security, Foundation for a Strong America," September 16–18, at the Washington Hilton Hotel, Washington, D.C.

The seminar program on September 17 will be devoted to presentations by DOD officials. It will be keynoted by Joseph J. Liebling, Director for Security Policy, Office of the Assistant Secretary of Defense (Administration). Panel sessions are also planned on various aspects of the Defense Industrial Security Program, featuring key representatives of the Office of Defense Industrial Security, Defense Supply Agency. The purpose of the day's program is to inform industry of its primary functions in providing adequate protection to classified defense information, consistent with industry's contractual responsibilities.

Further information and registration forms for the seminar may be obtained by contacting William D. Wright Jr., American Society for Industrial Security, 2000 K Street NW, Room 651, Washington, D.C. 20006, Phone (202) 338–7676.

Army Materiel Command Undergoing Reorganization

[Editor's note: The article on the organization and operations of the Army Materiel Commond (AMC), planned for inclusion in the series on the materiel and logistics commands of the Defense Department carried in the past 1969 issues of the *Bulletin*, will be delayed until the realignment of AMC currently in progress is completed. The following item describes the highlights of the AMC reorganization plan.]

The Army Materiel Command began reorganizing its Washington, D.C., headquarters in early June under a realignment designed to streamline the managerial structure.

General Ferdinand J. Chesarek, AMC's commander, stated the purpose of the proposed realignment of the headquarter's organizational structure is to provide better control over assigned missions and functions, reduce the span of control of the commander, and achieve greater utilization of the managerial talent.

A number of important organizational changes are scheduled within the headquarters complex under the reorganization. Directly under the Commanding General is a principal Deputy Commanding General, serving as chief assistant and resource manager. Major General H.A. Miley Jr., a lieutenant general designee, former Assistant Deputy Chief of Staff for Logistics (Program and Budget), has been assigned to that position.

There will also be two new deputy commanding generals. Major General Walter J. Woolwine, former Director of Procurement and Production for AMC, is now Deputy Commanding General for Materiel Acquisition, with the responsibility of control of research and engineering, procurement and production, materiel requirements, logistics data management, and related functions on the industrial base. Major General William N. Redling, former Commanding General of the Army Transportation Center and Fort Eustis, Va., and Commandant of the Army Transportation School, is designated Deputy Commanding General for Logistics Support, with control of operational readiness functions, distribution, transportation, maintenance, international logistics and the AMC depot system, all in support of the Army in the field.

The Deputy for Laboratories, Dr. Robert A. Dillaway, will continue in his job, with a primary interest in the scientific community. He will also direct the activities of the AMC in-house laboratories.

Three other general officers named for assignment to Headquarters, AMC, are: Major General Leo B. Jones, as Chief of Staff; Brigadier General Theodore Antonelli, as Director of Distribution and Transportation; and Brigadier General James G. Kalergis, as Comptroller.

The directorates and separate offices are also being restructured under the realignment. The 67 project offices are being reduced to 49, with 10 being eliminated as their functions are assumed by the major subordinate commands, and 8 being combined with other project management offices.

The commander's span of control is also being reduced. Instead of 190 commands, agencies, or individuals reporting directly to the AMC Commander, there will be 78. The 60 percent eliminated will be placed under either commodity commanders or the newly designated deputy commanding generals.

There is also a change being made in the structure of project manager offices. Aircraft Weaponization is moving to Headquarters, Army Weapons Command, Rock Island, Ill.; and the Manned Aerial Vehicle for Surveillance office is relocating to Headquarters, Army Aviation Systems Command, St. Louis, Mo.

In instances where systems are well into the production cycle, the project management offices are being eliminated, and a study is under way to determine whether project manager control should be exercised at the commodity command level rather than at the headquarters level.

Project management offices slated to be discontinued include: Flat Top, M113 Italy Co-Production, M107/M110 Artillery, Amphibians and Watercraft, Mortar Ammunition, Multi-fuel Engines, Rifle, and Goer Vehicles. The Sergeant and Artillery Ammunition offices are also scheduled for disestablishment, pending approval of the Secretary of the Army. Programs scheduled for combining are: Mallard/Random Access Discrete Address, Special Warfare/Special Mission Operations, Manned Aerial Vehicle Surveillance, Mohawk, Uttas/Iroquois, Air Traffic Management/Position and Navigation Systems, Selected Priority Operations/TPQ–28, Air Defense Control and Coordination/Target Missile, and AACOMS/TAS/Teletypewriter/COMSEC.

When completed, the realignment of AMC will:

- Assign to the Deputy Commanding General of AMC the role of resource manager for the command. As such, he will supervise the activities of the Comptroller, the Director of Personnel and Training, and the Director of Installations and Services.
- Elevate the position of the Director of Quality Assurance, in line with a need for top command attention in this area.
- Elevate the position of the Director of Management Information Systems. In his expanded role, he will accelerate the development of automated management systems, and provide key indicators and trends for the Commanding General and other top managers.
- Expand the use of the Army Materiel Systems Analysis Agency, Aberdeen Proving Ground, Md., to accelerate the command's system analysis effort.
- Increase the use of the AMC Board, Aberdeen Proving Ground, for long-range planning in financial management, materiel acquisition, and research and development.

The reorganization of AMC is being accomplished on a phased basis over a period of months.

Status of Funds Quarterly Report

Outlays

Third Quarter, Fiscal Year 1969

(Thousands of Dollars)

Department of Defense	Outlays				Unpaid obligations	
	January 1969	February 1969	March 1969	Cum thru 31 Mar 1969	At start of year	As of 31 Mar 1969
Military Personnel						
Active forces	1,605,522	1,653,112	1,657,909	15,061,173	761,917	904,810
Reserve forces	54,743	57,349	61,315	669,332	149,746	116,264
Retired pay	202,331	210,851	212,536	1,801,651	6,880	7,529
Undistributed	73,606	67,970	—160,629	—168,017	—	168,017
Total—Military Personnel	1,936,202	1,989,282	1,771,131	17,364,139	918,543	1,196,620
Operation and Maintenance	1,695,278	1,771,846	1,837,926	16,008,770	4,033,198	4,331,646
Procurement						
Aircraft	795,437	728,465	808,483	7,029,460	9,591,226	7,905,867
Missiles	204,789	184,833	251,584	1,801,276	2,069,735	2,500,583
Ships	153,309	173,359	157,693	1,419,634	3,447,418	3,208,191
Tracked combat vehicles	38,827	45,289	35,223	337,945	610,190	501,453
Ordnance, vehicles and related equipment	589,797	638,223	612,503	4,543,208	6,595,367	7,173,877
Electronics and communications	125,049	104,320	109,125	1,036,340	1,881,334	1,560,719
Other procurement	188,629	90,467	180,495	1,358,700	2,056,183	1,955,063
Undistributed	—6,557	—15,274	2,553	374,777	—7,225	—393,466
Total—Procurement	2,089,280	1,949,680	2,157,657	17,901,337	26,244,228	24,412,288
Research, Development, Test, & Evaluation						
Military sciences	90,349	70,741	93,070	721,534	777,774	696,728
Aircraft	42,345	56,990	107,217	682,798	717,451	740,990
Missiles	171,485	183,271	187,335	1,692,034	983,018	1,289,142
Astronautics	92,623	85,143	77,645	887,580	487,480	563,365
Ships	32,028	21,175	31,014	234,186	245,279	307,248
Ordnance, vehicles and related equipment	30,428	24,857	29,120	236,718	216,577	263,353
Other equipment	69,874	63,273	69,797	561,744	478,981	486,978
Program-wide management and support	48,722	45,994	51,605	439,246	189,338	225,415
Undistributed	3,940	—11,632	28,785	11,505	—1,633	—13,706
Total—Research, Development, Test, & Evaluation	581,793	539,810	675,591	5,467,346	4,094,265	4,559,512
Military Construction	116,546	103,205	155,125	1,049,740	1,784,255	1,721,361
Family Housing	51,402	48,999	55,570	410,016	174,687	283,668
Civil Defense	5,980	7,941	8,544	66,990	80,629	60,104
Other—Special Foreign Currency Program	36	7	45	803	1,071	678
Revolving and Management Funds	102,391	—176,030	—109,927	—720,925	6,078,411	6,632,424
Subtotal—Military Functions-Federal Funds	6,578,910	6,234,741	6,551,662	57,548,217	43,409,287	43,198,299
Military Assistance—Federal Funds	56,851	14,588	86,952	407,359	1,823,034	1,606,207
Grand Total—Federal Funds	6,635,761	6,249,329	6,638,614	57,955,576	45,232,322	44,804,506
Total—Military Functions-Bud. Concept adj.	—11,410	—7,586	—8,619	—95,984	8,794	3,304
Total—Military Assistance-Bud. Concept adj.	19,270	—7,260	—4,092	150,674	433,454	250,103
Grand Total—Budget Concept adjustments	7,860	—14,846	—12,711	54,690	442,248	253,407
TOTAL—DEPARTMENT OF DEFENSE	6,643,621	6,234,483	6,625,902	58,010,265	45,674,570	45,057,913

Department of the Army

Military Personnel						
Active forces	603,164	664,995	694,651	6,114,416	382,077	428,188
Reserve forces	34,568	34,683	35,608	445,384	112,578	78,677
Undistributed	109,445	84,080	—171,652	—178,183	—	178,183
Total—Military Personnel	747,177	783,758	558,607	6,381,617	494,654	685,048
Operation and Maintenance	549,259	598,862	658,658	5,914,915	1,541,708	1,377,922
Procurement						
Aircraft	83,200	92,182	102,271	836,531	1,343,518	1,031,936
Missiles	55,113	46,719	41,849	402,717	629,712	922,017
Tracked combat vehicles	38,343	44,439	34,212	323,697	586,046	479,139
Ordnance, vehicles, and related equipment	335,023	236,551	244,816	2,060,255	3,445,481	3,717,181
Electronics and communications	50,991	30,804	37,285	340,888	688,774	569,654
Other procurement	54,908	33,787	42,427	373,664	769,510	611,454
Undistributed	—965	—9,541	—22,480	352,600	—7,225	—371,238
Total—Procurement	616,611	474,941	480,379	4,690,351	7,455,816	6,960,143
Research, Development, Test, and Evaluation						
Military sciences	10,255	8,439	7,988	81,724	98,272	102,195
Aircraft	11,752	6,966	8,037	76,012	78,199	89,005
Missiles	43,020	58,255	59,858	480,351	386,366	520,979
Astronautics	544	232	688	6,612	7,865	5,067
Ordnance, vehicles, and related equipment	13,723	15,316	13,690	120,909	110,532	119,107
Other equipment	26,403	27,855	29,623	248,739	196,748	199,768
Program-wide management and support	6,131	5,741	6,425	63,699	33,898	35,763
Undistributed	13,887	—11,755	21,573	42,183	—1,633	—44,386
Total—Research, Development, Test, & Evaluation	125,715	111,049	147,882	1,120,229	910,247	1,027,498
Military Construction	31,798	35,813	82,581	362,975	768,046	688,345
Revolving and Management Funds	—765	—23,560	17,117	—26,100	1,955,905	1,813,564
Army—Federal Funds	2,069,796	1,980,863	1,945,224	18,443,987	13,126,377	12,552,520
Army—Budget Concept adjustments	—4,856	—3,067	—3,142	—47,101	10	—430
TOTAL—DEPARTMENT OF THE ARMY	2,064,940	1,977,796	1,942,081	18,396,885	13,126,387	12,552,091

Department of the Navy

	Outlays				Unpaid obligations	
	January 1969	February 1969	March 1969	Cum thru 31 Mar 1969	At start of year	As of 31 Mar 1969
Military Personnel						
Active forces	495,052	477,093	476,902	4,384,217	225,093	239,388
Reserve forces	10,107	11,374	14,003	110,919	22,898	26,885
Undistributed	—25,400	—1,615	9,969	9,689	—	—9,689
Total—Military Personnel	479,759	486,852	500,874	4,504,825	247,991	256,584
Operation and Maintenance	440,559	478,823	485,511	4,148,102	1,466,352	1,675,976
Procurement						
Aircraft	234,427	186,776	251,103	2,085,978	3,218,049	3,041,500
Missiles	33,826	37,019	65,208	374,728	547,934	740,294
Ships	153,309	173,359	157,693	1,419,634	3,447,418	3,208,191
Tracked combat vehicles	484	850	1,011	14,248	24,144	22,314
Ordnance, vehicles, and related equipment	124,779	155,477	186,405	1,208,804	1,713,934	1,888,405
Electronics and communications	38,489	46,416	45,382	384,814	645,301	545,985
Other procurement	106,127	—21,222	85,934	600,669	1,143,225	1,228,828
Undistributed	—10,930	816	24,950	31,714	—	—31,778
Total—Procurement	680,512	579,489	817,688	6,120,589	10,740,005	10,643,739
Research, Development, Test, and Evaluation						
Military sciences	16,873	17,836	15,191	143,962	121,458	141,180
Aircraft	28,369	21,790	20,802	246,507	257,524	318,337
Missiles	50,739	52,077	49,810	502,017	258,025	344,351
Astronautics	1,703	1,380	2,764	15,361	16,259	17,779
Ships	32,028	21,175	31,014	234,186	245,279	307,248
Ordnance, vehicles, and related equipment	16,705	9,541	15,430	115,809	106,045	144,246
Other equipment	12,911	10,652	11,717	92,863	79,604	88,585
Program-wide management and support	14,502	20,335	23,073	169,580	133,064	161,627
Undistributed	—11,230	2,107	4,947	3,212	—	—3,212
Total—Research, Development, Test, & Evaluation	162,600	156,893	174,748	1,523,497	1,217,258	1,520,141
Military Construction	43,808	29,997	22,403	306,386	573,575	654,341
Revolving and Management Funds	117,426	—19,644	—40,303	—108,177	2,269,078	2,178,669
Navy—Federal Funds	1,924,664	1,712,408	1,960,922	16,495,222	16,514,258	16,929,451
Navy—Budget Concept adjustments	—4,086	—1,997	—2,323	—26,748	110	693
TOTAL—DEPARTMENT OF THE NAVY	**1,920,578**	**1,710,411**	**1,958,599**	**16,468,474**	**16,514,368**	**16,930,143**

Department of the Air Force

Military Personnel						
Active forces	507,306	511,024	486,356	4,562,540	154,747	237,234
Reserve forces	10,068	11,292	11,704	113,029	14,270	10,702
Undistributed	—10,439	—14,495	1,054	477	—	—477
Total—Military Personnel	506,935	507,821	499,114	4,676,046	169,017	247,459
Operation and Maintenance	602,684	611,306	606,366	5,134,222	927,881	1,178,610
Procurement						
Aircraft	477,810	449,507	455,109	4,106,951	5,029,659	3,832,431
Missiles	115,850	101,095	144,527	1,023,831	892,089	838,272
Ordnance, vehicles, and related equipment	129,639	245,783	181,281	1,271,119	1,434,835	1,568,091
Electronics and communications	35,176	26,424	26,196	304,258	539,008	439,748
Other procurement	25,087	75,947	48,704	360,322	100,001	73,696
Undistributed	5,282	—6,529	96	—11,415	—	11,428
Total—Procurement	788,844	892,228	855,912	7,055,064	7,995,592	6,763,666
Research, Development, Test, & Evaluation						
Military sciences	17,425	11,075	14,215	118,908	104,162	101,574
Aircraft	2,224	28,234	78,378	360,279	381,728	333,648
Missiles	77,726	72,939	77,667	709,666	338,627	423,812
Astronautics	90,376	83,531	74,193	865,607	463,356	540,519
Other equipment	30,560	24,766	28,457	220,142	202,629	198,625
Program-wide management and support	28,089	19,918	22,107	205,967	22,376	28,025
Undistributed	1,283	—1,984	2,265	—33,890	—	33,892
Total—Research, Development, Test, & Evaluation	247,682	238,478	297,284	2,446,680	1,512,878	1,660,094
Military Construction	39,723	36,176	49,023	372,467	425,858	363,331
Revolving and Management Funds	—6,754	—114,906	—64,479	—415,673	521,170	1,466,671
Air Force—Federal Funds	2,179,115	2,171,102	2,243,221	19,268,806	11,552,396	11,679,830
Air Force—Budget Concept adjustments	—2,466	—2,522	—3,152	—22,123	8,675	2,791
TOTAL—DEPARTMENT OF THE AIR FORCE	**2,176,649**	**2,168,580**	**2,240,069**	**19,246,683**	**11,561,071**	**11,682.621**

Defense Agencies/Office of the Secretary of Defense

	Outlays				Unpaid obligations	
	April 1969	May 1969	June 1969	Cum thru 31 Mar 1969	At start of year	As of 31 Mar 1969
Military Personnel						
Retired Pay	202,331	210,851	212,536	1,801,651	6,880	7,529
Operation and Maintenance	102,776	82,855	87,391	811,531	97,258	99,138
Procurement						
Ordnance, vehicles, and related equipment	356	412	1	3,030	1,117	200
Electronics and communications	393	676	260	6,380	8,251	5,332
Other procurement	2,507	1,955	3,430	24,045	43,447	41,085
Undistributed	56	—20	—13	1,878	—	—1,878
Total—Procurement	3,312	3,023	3,678	35,333	52,815	44,739
Research, Development, Test, & Evaluation						
Military sciences	45,796	33,391	55,676	376,940	453,882	351,779
Military Construction	1,217	1,220	1,118	7,912	16,777	15,344
Family Housing	51,402	48,999	55,570	410,016	174,687	283,668
Other—Special Foreign Currency Program	36	7	45	803	1,071	678
Revolving and Management Funds	—7,515	—17,920	—22,263	—170,975	1,332,258	1,173,520
Defense Agencies—Federal Funds	399,355	362,427	393,751	3,273,212	2,135,628	1,976,393
Defense Agencies—Budget Concept adjustments	—2	—	—1	—11	—	251
TOTAL—DEFENSE AGENCIES/OSD	399,353	362,427	393,750	3,273,201	2,135,628	1,976,644

Office of Civil Defense

Civil Defense	5,980	7,941	8,544	66,990	80,629	60,104
Revolving and Management Funds	—	—	—	—	—	—
TOTAL—OFFICE OF CIVIL DEFENSE-FED. FUNDS	5,980	7,941	8,544	66,990	80,629	60,104

Military Assistance

Military Personnel	38	20	18	198	353	184
Operation and Maintenance	26,709	17,181	24,693	177,523	230,840	264,420
Procurement						
Aircraft	6,521	2,745	16,202	72,464	226,880	199,194
Missiles	640	42	1,785	4,755	16,035	11,046
Ships	2,764	186	8,092	15,548	43,984	80,417
Ordnance, vehicles, and related equipment	13,468	761	23,688	94,355	192,738	166,454
Electronics and communications	4,327	1,186	8,386	43,897	101,235	90,938
Other procurement	4,062	632	5,889	29,082	88,420	83,011
Total—Procurement	31,782	5,552	64,042	260,101	669,292	631,060
Research, Development, Test, & Evaluation	—	—	—	10	35	49
Military Construction	583	—	36	1,554	6,809	4,739
Revolving Fund	—5,900	—2,435	—2,395	—5,036	848,233	700,445
Undistributed	3,640	—5,730	558	—26,991	67,472	5,310
Subtotal—Military Assistance	56,851	14,588	86,952	407,359	1,823,034	1,606,207
Total—Military Assistance-Bud. Concept adjustments	19,270	—7,260	—4,092	150,674	433,454	250,103
TOTAL—MILITARY ASSISTANCE	76,122	7,328	82,860	558,033	2,256,488	1,856,310

Obligations

Department of Defense	Available for Obligation	Obligations				Unobligated balance 31 Mar 1969
		January 1969	February 1969	March 1969	Cum thru 31 Mar 1969	
Military Personnel						
Active forces	19,576,230	1,708,254	1,656,281	1,716,921	15,509,952	4,066,278
Reserve forces	909,786	54,315	64,075	51,797	629,645	280,141
Retired pay	2,275,000	202,273	211,159	212,660	1,801,581	473,419
Total—Military Personnel	22,761,016	1,964,843	1,931,514	1,981,377	17,941,177	4,819,839
Operation and Maintenance	24,026,388	2,572,273	1,589,646	1,750,005	18,007,210	6,019,178
Procurement						
Aircraft	11,513,853	697,272	633,150	530,097	5,684,276	5,829,577
Missiles	4,030,400	171,840	204,358	186,317	2,326,206	1,704,194
Ships	3,685,309	92,987	97,857	129,581	1,240,564	2,444,745
Tracked combat vehicles	478,535	13,710	31,237	49,762	266,136	212,399
Ordnance, vehicles and related equipment	9,636,675	540,515	266,852	314,106	6,634,327	3,002,348
Electronics and communications	2,348,224	77,258	80,500	124,352	838,984	1,509,240
Other procurement	3,036,537	187,092	253,310	146,077	1,658,790	1,377,747
Undistributed	568,026	—	—	—	—	568,026
Total—Procurement	35,297,558	1,780,673	1,567,265	1,480,289	18,649,280	16,648,279
Research, Development, Test, & Evaluation						
Military sciences	1,147,541	90,370	69,338	73,119	708,070	439,471
Aircraft	1,170,871	31,050	109,288	113,111	707,604	463,267
Missiles	2,708,868	115,922	226,624	99,432	2,081,962	626,906
Astronautics	1,286,287	136,373	24,991	130,424	1,019,336	266,951
Ships	468,225	22,416	20,086	15,911	314,673	153,552
Ordnance, vehicles, and related equipment	414,287	27,473	20,391	27,124	285,496	128,791
Other equipment	1,035,598	61,456	48,768	53,165	581,936	453,662
Program-wide management and support	1,106,305	81,544	59,595	113,358	732,349	373,956
Emergency Fund	3,998	—	—	—	—	3,998
Undistributed	59,582	—	—	—	—	59,582
Total—Research, Development, Test, & Evaluation	9,401,563	566,602	579,083	625,642	6,431,427	2,970,135
Military Construction	3,532,935	153,059	96,794	140,014	1,342,633	2,190,301
Family Housing	745,397	116,847	46,446	42,779	527,711	217,686
Civil Defense	69,206	7,193	5,251	5,422	48,474	20,732
Other	15,742	3	2	271	410	15,332
Subtotal—Military Functions	95,849,805	7,161,493	5,816,000	6,025,799	62,948,322	32,901,484
Military Assistance	682,001	102,686	91,986	13,065	343,353	338,648
TOTAL—DEPARTMENT OF DEFENSE	96,531,806	7,264,179	5,907,987	6,038,864	63,291,675	33,240,130

Department of the Army

	Available for Obligation	Obligations				Unobligated balance 31 Mar 1969
		January 1969	February 1969	March 1969	Cum thru 31 Mar 1969	
Military Personnel						
Active forces	8,094,634	701,847	668,952	713,767	6,347,645	1,746,989
Reserve forces	593,600	33,345	34,019	36,048	404,477	189,123
Total—Military Personnel	8,688,234	735,192	702,970	749,816	6,752,122	1,936,112
Operation and Maintenance	9,040,735	837,797	603,417	687,376	6,534,353	2,506,381
Procurement						
Aircraft	1,164,965	31,745	34,642	44,865	542,130	622,835
Missiles	950,516	13,393	39,736	12,978	760,845	189,671
Tracked combat vehicles	449,111	13,377	29,707	48,154	253,718	195,393
Ordnance, vehicles and related equipment	5,491,654	231,670	194,888	107,733	3,837,452	1,654,202
Electronics and communications	870,462	30,582	32,115	30,183	293,801	576,661
Other procurement	602,376	33,052	54,009	14,202	264,676	337,700
Undistributed	380,277	—	—	—	—	380,277
Total—Procurement	9,909,361	353,819	385,097	258,115	5,952,622	3,956,739
Research, Development, Test, & Evaluation						
Military sciences	197,445	14,526	7,649	13,136	132,453	64,992
Aircraft	159,045	5,844	10,132	6,993	87,616	71,429
Missiles	788,390	28,598	108,889	23,393	620,806	167,584
Astronautics	12,194	392	387	628	3,866	8,328
Ordnance, vehicles and related equipment	217,145	10,639	12,735	13,579	131,365	85,780
Other equipment	477,103	37,375	19,353	30,869	256,859	220,244
Program-wide management and support	98,509	6,241	6,046	5,063	68,298	30,211
Undistributed	34,973	—	—	—	—	34,973
Total—Research, Development, Test, & Evaluation	1,984,804	103,615	165,191	93,661	1,301,263	683,541
Military Construction	1,545,523	46,175	28,267	39,142	471,264	1,074,259
TOTAL—DEPARTMENT OF THE ARMY	**31,168,657**	**2,076,598**	**1,884,942**	**1,828,110**	**21,011,624**	**10,157,033**

Department of the Navy

Military Personnel						
Active forces	5,763,804	495,666	479,985	500,586	4,487,938	1,275,866
Reserve forces	156,256	10,754	12,838	13,111	114,858	41,398
Total—Military Personnel	5,920,060	506,420	492,823	513,697	4,602,796	1,317,264
Operation and Maintenance	6,657,705	670,584	441,253	487,229	4,921,747	1,735,958
Procurement						
Aircraft	3,514,905	236,794	366,177	232,520	1,948,742	1,566,163
Missiles	1,000,039	37,434	28,281	68,373	585,057	414,982
Ships	3,685,309	92,987	97,857	129,581	1,240,564	2,444,745
Tracked combat vehicles	29,424	333	1,530	1,608	12,418	17,006
Ordnance, vehicles and related equipment	2,202,943	258,660	37,030	169,151	1,390,386	812,557
Electronics and communications	802,875	25,198	20,118	53,472	294,192	508,683
Other procurement	1,876,817	141,923	130,523	77,886	1,031,041	845,776
Undistributed	—149,156	—	—	—	—	—149,156
Total—Procurement	12,963,155	793,326	681,517	732,591	6,502,400	6,460,755
Research, Development, Test, & Evaluation						
Military sciences	223,221	14,591	13,553	12,703	169,859	53,362
Aircraft	448,396	9,339	80,039	55,684	307,473	140,923
Missiles	789,061	15,131	19,790	34,779	607,437	181,624
Astronautics	25,100	2,042	318	1,123	17,022	8,078
Ships	468,225	22,416	20,086	15,911	314,673	153,552
Ordnance, vehicles and related equipment	197,142	16,834	7,656	13,545	154,131	43,011
Other equipment	141,753	6,812	5,085	7,492	103,790	37,963
Program-wide management and support	723,206	53,556	33,305	88,734	441,347	281,859
Undistributed	235	—	—	—	—	235
Total—Research, Development, Test, & Evaluation	3,016,339	140,721	179,832	229,971	2,115,732	900,607
Military Construction	1,309,757	60,217	45,348	57,858	554,830	754,927
TOTAL—DEPARTMENT OF THE NAVY	**29,867,017**	**2,171,268**	**1,840,772**	**2,021,346**	**18,697,505**	**11,169,512**

Department of the Air Force

	Available for Obligation	Obligations				Unobligated balance 31 Mar 1969
		January 1969	February 1969	March 1969	Cum thru 31 Mar 1969	
Military Personnel						
Active forces	5,717,792	510,741	507,344	502,568	4,674,369	1,043,423
Reserve forces	159,930	10,216	17,218	2,638	110,310	49,620
Total—Military Personnel	5,877,722	520,957	524,562	505,206	4,784,679	1,093,043
Operation and Maintenance	7,204,552	964,975	462,368	487,372	5,705,153	1,499,400
Procurement :						
Aircraft	6,833,983	428,733	232,331	252,712	3,193,404	3,604,579
Missiles	2,079,845	121,013	136,341	104,966	980,304	1,099,541
Ships	—	—	—	—	—	—
Ordnance, vehicles and related equipment	1,939,163	49,985	34,912	37,036	1,404,376	534,787
Electronics and communications	664,890	21,261	27,920	40,268	247,530	417,360
Other procurement	459,572	6,716	65,653	51,023	334,017	125,555
Undistributed	311,907	—	—	—	—	311,907
Total—Procurement	12,289,360	627,710	497,157	486,002	6,159,628	6,129,732
Research, Development, Test, & Evaluation						
Military sciences	187,252	15,381	14,185	10,700	127,109	60,143
Aircraft	563,430	15,867	19,117	50,434	312,515	250,915
Missiles	1,131,417	72,193	97,945	41,260	853,719	277,698
Astronautics	1,248,993	133,939	24,286	128,673	998,448	250,545
Other equipment	416,742	17,269	24,330	14,804	221,287	195,455
Program-wide management and support	284,590	21,747	20,244	19,561	222,704	61,886
Undistributed	24,374	—	—	—	—	24,374
Total—Research, Development, Test, & Evaluation	3,856,799	276,395	200,108	265,430	2,735,782	1,121,017
Military Construction	622,961	43,908	22,017	42,293	310,060	312,901
TOTAL—DEPARTMENT OF THE AIR FORCE	29,851,394	2,433,946	1,706,211	1,786,303	19,695,302	10,156,093

Defense Agencies/Office of the Secretary of Defense

Military Personnel						
Retired Pay	2,275,000	202,273	211,159	212,660	1,801,581	473,419
Operation and Maintenance	1,123,396	98,916	82,608	88,028	845,957	277,438
Procurement						
Ordnance, vehicles and related equipment	2,915	200	22	186	2,113	802
Electronics and communications	9,997	217	347	429	3,461	6,536
Other procurement	97,772	5,401	3,125	2,966	29,056	68,716
Undistributed	24,998	—	—	—	—	24,998
Total—Procurement	135,682	5,818	3,494	3,581	34,630	101,052
Research, Development, Test, & Evaluation						
Military sciences	539,623	45,872	33,951	36,580	278,649	260,974
Emergency Fund	3,998	—	—	—	—	3,998
Undistributed	—	—	—	—	—	—
Total—Research, Development, Test, & Evaluation	543,621	45,872	33,951	36,580	278,649	264,972
Military Construction	54,694	2,758	1,164	720	6,479	48,215
Family Housing	745,397	116,847	46,446	42,779	527,711	217,686
Other	15,742	3	2	271	410	15,332
TOTAL—DEFENSE AGENCIES/OSD	4,893,532	472,488	378,823	384,619	3,495,417	1,398,115

Military Assistance

Civil Defense	69,206	7,193	5,251	5,422	48,474	20,732

Office of Civil Defense

Military Personnel	79	10	—14	5	79	—
Operation and Maintenance	552,682	76,176	36,173	7,666	211,730	340,952
Procurement						
Aircraft	38,835	7,254	19,926	2,771	41,433	—2,598
Missiles	—38	276	—575	270	—38	—
Ships	9,048	1,913	3,912	1,411	8,914	134
Ordnance, vehicles and related equipment	49,863	13,633	19,279	111	49,862	1
Electronics and communications	21,182	2,860	9,330	401	21,166	16
Other procurement	10,907	653	4,233	666	10,711	196
Total—Procurement	129,797	26,589	56,105	5,630	132,048	—2,251
Research, Development, Test, & Evaluation	—27	—	—	—	—27	—
Military Construction	—376	—91	—279	—235	—467	91
Undistributed	—155	2	3	—	—8	—147
TOTAL—MILITARY ASSISTANCE	682,001	102,686	91,986	13,065	343,353	338,648

NOTE: All outlay amounts are on a net Treasury basis (gross payments less reimbursement collections), whereas obligations and unpaid obligations are on a gross basis (inclusive of reimbursable activity performed by components of DOD for each other). Therefore, unpaid obligations as of the end of the reporting month cannot be computed from other figures in this report.

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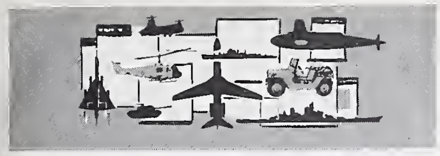

DEFENSE PROCUREMENT

Contracts of $1,000,000 and over awarded during the month of June 1969.

DEFENSE SUPPLY AGENCY

2—**Standard Oil Co. of California**, El Segundo, Calif. $2,017,968. 12,994,000 gallons of kerosene. Defense Fuel Supply Center, Alexandria, Va. DSA 600–69–D–2080.

—**Page Airways, Inc.**, Rochester, N.Y. $1,260,449. Operation and maintenance of Defense Industrial Plant Equipment Facility, Atchison, Kan. Defense Industrial Plant Equipment Center, Memphis, Tenn. DSA 002–68–C–0002–P020.

3—**Prestex, Inc.**, New York, N.Y. $2,088,725. 2,238,000 yards of wind-resistant poplin rip stop cloth. Spindale, N.C., Thomaston, Ga., and Memphis, Tenn. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–69–C–2448.

4—**Prestex, Inc.**, New York, N.Y. $2,163,071. 2,476,000 yards of cotton cloth. Joanna, S.C., Ninety Six, S.C., Alexander City, Ala., Memphis, Tenn., and Westerly, R.I. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–69–C–2587.

6—**Standard Oil Co. of Calif.**, San Francisco, Calif. $27,341,529. JP–4 jet fuel. El Segundo and Richmond, Calif., Honolulu, Hawaii, El Paso, Tex., East Pasco, Wash., and Kenai, Alaska. Defense Fuel Supply Center, Alexandria, Va. DSA 600–69–D–2053.

10—**Eastman Kodak Co.**, Rochester, N.Y. $1,049,017. 43,000 rolls of aerial photographic film. Defense General Supply Center, Richmond, Va. DSA 400–69–C–6540.

—The Defense Personnel Support Center, Philadelphia, Pa., issued the following four contracts for 45 inch width cotten sateen cloth:

Riegel Textile Corp., New York, N.Y. $2,572,680. 4,400,000 linear yards. Trion, Ga. DSA 100–69–C–2606.

Prestex, Inc., New York, N.Y. $1,216,143. 2,130,000 linear yards. Batesburg, S.C., Dalton, Ga., Opelika, Ala., and Memphis, Tenn. DSA 100–69–C–2607.

West Point Pepperell, Inc., New York, N.Y. $1,429,172. 2,500,000 linear yards. Lindale, Ga., and Opelika, Ala. DSA 100–69–C–2608.

J. P. Stevens and Co., Inc., New York, N.Y. $1,821,300. 3,250,000 linear yards. Piedmont, Anderson and Wallace, S.C. DSA 100–69–C–2605.

11—**Gulf Oil Corp.**, New York, N.Y. $2,179,800. 21,000,000 gallons of JP–5 jet fuel. DSA 600–69–D–1977. $4,575,100. 40,868,500 gallons of JP–4 jet fuel. DSA 600–69–D–2023. Defense Fuel Supply Center, Alexandria, Va.

—**Humble Oil and Refining Co.**, Houston, Tex. $1,150,650. 350,000 barrels of boiler fuel distillate. Defense Fuel Supply Center, Alexandria, Va. DSA 600–69–D–1873.

12—**Burlington Industries, Inc.**, Cleveland, Tenn. $1,419,664. 258,099 wool bed blankets. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–69–C–2675.

13—**Galion Iron and Manufacturing Co.**, Galion, Ohio. $2,648,778. Road graders. Defense Construction Supply Center, Columbus, Ohio. DSA 700–69–C–8497.

—**J. P. Stevens and Co., Inc.**, New York, N.Y. $3,360,227. 2,972,000 linear yards (45-inch width) of wind resistant, water repellent cotton sateen and nylon cloth. Piedmont and Wallace, S.C. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–69–C–2705.

CONTRACT LEGEND

Contract information is listed in the following sequence: Date—Company — Value — Material or Work to be Performed—Location of Work Performed (if other than company plant) — Contracting Agency—Contract Number.

—**Lion Uniform, Inc.**, Dayton, Ohio. $1,740,060. 42,000 pairs of men's flying coveralls. Williamsburg, Ky. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–69–C–2702.

—**Kings Point Manufacturing Co., Inc.**, Fayetteville, N.C. $1,962,662. 42,000 pairs of men's flying coveralls. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–69–C–2701.

—**Prestex, Inc.**, New York, N.Y. $1,162,380. 600,000 yards of ballistic nylon cloth. Shawmut, Ala., and Rhodiss, N.C. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–69–C–2584.

—**West Point Pepperell Inc.**, New York, N.Y. $1,491,750. 382,000 yards of natural color ballistic nylon cloth and 381,000 yards of olive green color. Shawmut, Ala. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–69–C–2585.

—**Putnam Mills Inc.**, New York, N.Y. $2,132,060. 1,100,000 yards of ballistic nylon cloth. Langdale, Shawmut and Lanette, Ala., Rhodiss, N.C., and Rockville, Conn. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–69–C–2583.

—**Western Fuel Co. of Yakima, Inc.**, Yakima, Wash. $1,420,428. 20,774,800 gallons of fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600–69–D–2249.

—**Humble Oil and Refining Co.**, Houston, Tex. $1,428,140. 1,407,312 quart cans of aircraft lube oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600–69–C–2436.

—**Stauffer Chemical Co.**, New York, N.Y. $1,324,510. 1,041,672 quart cans and 1,662 55-gallon drums of synthetic lube oil for aircraft engines. Defense Fuel Supply Center, Alexandria, Va. DSA 600–69–C–1722.

16—**Standard Oil Co. of Calif.**, San Francisco, Calif. $1,594,478. Gasoline, fuel oil, and solvents. Defense Fuel Supply Center, Alexandria, Va. DSA 600–69–D–1710.

17—**Vitro Minerals Corp.**, Denver, Colo. $1,564,380. 241,000 net tons of sub-bituminous coal. Cripple Creek Mine, Suntrana Branch, Alaska. Defense Fuel Supply Center, Alexandria, Va. DSA 600–69–C–2335.

—**Usibelli Coal Mine, Inc.**, Usibelli, Alaska. $1,171,700. 176,000 net tons of sub-bituminous coal. Usibelli Mine, Suntrana, Alaska. Defense Fuel Supply Center, Alexandria, Va. DSA 600–69–C–2336.

20—**Franklin Clothes, Inc.**, Woodbine, N.J. $2,389,749. Men's tropical polyester and wool coats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–69–C–2736.

23—**Standard Oil of Calif., Western Operations, Inc.**, San Francisco, Calif. $2,772,631. 19,435,046 gallons of various petroleum products. Defense Fuel Supply Center, Alexandria, Va. DSA 600–69–D–2242.

—**Griffin Galbraith Fuel Co.**, Tacoma, Wash. $1,311,542. 10,182,000 gallons of fuel oil and 1,187,600 gallons of diesel fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600–69–C–2230.

24—**Shell Oil Co.**, New York, N.Y. $1,452,676. Aviation fuels. Defense Fuel Supply Center, Alexandria, Va. DSA 600–69–D–1861.

30—The Defense Construction Supply Center, Columbus, Ohio, has awarded the following five contracts:

Inter-Alloys Corp., Bartow, Fla. $1,556,145. 60-ton aluminum highway bridges. DSA 700–69–C–G970.

Jeta Power, Inc., Sloatsburg, N.Y. $1,470,150. Generator sets. DSA 700–69–C–H047.

Met-Pro Water Treatment Corp., Lansdale, Pa. $1,165,289. Water purification equipment sets. DSA 700–69–C–H029.

Allis Chalmers Mfg. Co., Milwaukee, Wis. $1,142,580. Motorized graders. DSA 700–69–C–E573.

Jeta Power, Inc., Sloatsburg, N.Y. $1,000,743. Generator sets. DSA 700–69–C–H046.

—The Defense General Supply Center, Richmond, Va., awarded the following four contracts:

Pettibone Mulliken Corp., Washington, D.C. $1,614,008. Fork lift trucks. DSA 400–69–C–5415.

Towmotor Corp., Cleveland, Ohio. $1,318,275. Fork lift trucks. Mentor, Ohio. DSA 400–69–C–5747.

Otis Elevator Co., Cleveland, Ohio. $1,063,140. Fork lift trucks. DSA 400–69–C–6973.

Otis Elevator Co., Cleveland, Ohio. $1,572,077. Fork lift trucks. DSA 400–69–C–6972.

—The Defense Fuel Supply Center, Alexandria, Va., has awarded the following two contracts for various quantities of fuel oil and gasoline for use at camps, posts and stations in Delaware, the District of Columbia, Indiana, Kentucky, Maryland, Ohio, Tennessee, Virginia and W. Virginia.

BP Oil Corp., Atlanta, Ga. $1,611,600. DSA 600–69–D–2273.

American Oil Co., Chicago, Ill. $2,186,319. DSA 600–69–D–2265.

DEPARTMENT OF THE ARMY

3—**Bell Aerospace Corp.**, Fort Worth, Tex. $12,628,000 (contract modification.) Additional UH–1N helicopters and additional funding for the original quantity. Hurst, Tex. Army Aviation Systems Command, St. Louis, Mo. DA–AJ01–69–C–0085.

—**Swaney Corp.**, Titusville, Fla. $1,925,035. Modification to launch complex 17, Cape Kennedy, Fla. Army Engineer District, Canaveral, Patrick AFB, Fla. DA–CA18–69–C–9064.

—**Eugene Luhr and Co.**, West Sacramento, Calif. $1,072,770. Construction on both banks of the Sacramento River and Georgiana Slough, Calif. Army Engineer District, Sacramento, Calif. DA–CW05–69–C–0076.

4—**Levinson Steel Co.**, Pittsburgh, Pa. $13,883,558. Metal parts for 105mm projectiles. Hayes Army Ammunition Plant, Pittsburgh, Pa. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA–AA09–C–0023.

—**R. G. LeTourneau, Inc.**, Longview, Tex. $2,186,730 (contract modification). Metal parts for 750 pound bombs. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA–AA09–69–C–0044.

—**Forsberg & Gregory Construction Co.**, Redlands, Calif. $1,720,319. Construction of three maintenance docks, Davis-Monthan AFB, Ariz. Army Engineer District, Los Angeles, Calif. DA–CA09–69–C–0180.

—**Leon H. Perlin Co., Inc.**, Newport News, Va. $1,679,000. Construction of shop classrooms for helicopter maintenance instruction, Fort Eustis, Va. Army Engineer District, Norfolk, Va. DA–CA65–69–C–0133.

—**Centex Construction Co., Inc.**, Dallas, Tex. $3,244,000. Construction of duplex buildings, Fort Hood, Tex. Army Engineer District, Fort Worth, Tex. DA–CA63–69–C–0167.

—**Jeta Power, Inc.**, Sloatsburg, N.Y. $1,228,224. 100 kw, 50-60 cycle generator sets. Army Mobility Equipment Command, St. Louis, Mo. DA–AK01–69–C–9281.

—**Litton Systems, Inc.**, Woodland Hills, Calif. $1,100,000 (contract modification). Digital computers, inertial measurement units, precision mounting fixtures, and purge and fill stations. Army Electronics Command, Fort Monmouth, N.J. DA–AB07–68–C–0345.

—**Continental Motors Corp.**, Mobile, Ala. $2,519,700 (contract modification). Rebuild AVDS1790–2A engines for the M60 tank. Army Tank Automotive Command, Warren, Mich. DA–AE07–69–C–1459.

5—**Main Cornice Works**, Beverly Hills, Calif. $1,144,442. Rehabilitation of 13 barracks buildings and construction of parking areas, Presidio, San Francisco, Calif. Army Engineer District, Sacramento, Calif. DA-CA05-69-C-0113.

6—**Norris Industries, Inc.**, Los Angeles, Calif. $8,649,907. 105mm cartridge cases. Riverbank, Calif. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0181.

—**Amtex Corp.**, Redwood City, Calif. $1,500,000. Classified research and development. Redwood City and Sunnyvale, Calif. Army Electronics Command, Fort Monmouth, N.J.

—**Boeing Co.**, Seattle, Wash. $1,313,254. Analysis of the Ballistic Missile Defense Alternative Study. Safeguard System Command, Huntsville, Ala. DA-HC60-69-C-0104.

—**Melbourne Brothers Construction Co.**, North Canton, Ohio. $1,175,000. Erect and furnish two pre-fabricated buildings, construct closed ramps and loading docks and miscellaneous work, Ravenna Army Ammunition Plant, Ohio. Army Engineer District, Louisville, Ky. DA-CA27-69-C-0037.

9—**Texas Instruments, Inc.**, Dallas, Tex. $1,500,000 (contract modification). Classified electronic equipment. Army Electronics Command, Fort Monmouth, N.J. DA-AB03-68-C-0425.

—**Wisconsin Motor Corp.**, Milwaukee, Wis. $6,298,912. 10 and 20 horsepower standard military engines. Army Mobility Equipment Command, St. Louis, Mo. DA-AK01-67-C-0887.

—**Bell Helicopter Co.**, Fort Worth, Tex. $2,398,617. Rotary wing hubs for UH-1 Huey helicopters. Hurst, Tex. Army Aviation Systems Command, St. Louis, Mo. DA-AJ01-69-A-0314.

—**Kaman Nuclear Corp.**, Colorado Springs, Colo. $1,261,898 (contract modification). Acquisition of part two of an EMP study for Safeguard Communications System Test Program. Safeguard Systems Command, Huntsville, Ala. DA-HC60-69-C-0061.

10—**General Electric Co.**, Burlington, Vt. $1,721,250 (contract modification). 20mm automatic guns, M61A1s and GAU-4/As, and SUU-23/A armament pods. Army Procurement Agency, New York, N.Y. DA-AF03-69-C-0027.

—**Teletype Corp.**, Skokie, Ill. $1,500,000. Classified electronic equipment. Army Electronics Command, Fort Monmouth, N.J.

—**Defense Metal Products Div., Southern Airways Co.**, Sylacouga, Ala. $7,597,260. Metal parts for 155mm projectiles. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0330.

—**John Wood Co.**, St. Paul, Minn. $1,356,753. Fin assemblies for 750-pound bombs, plus crate and suspension lugs. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0424.

—**Poloron Products, Inc.**, New Rochelle, N.Y. $1,362,793. 750-pound bomb fin assemblies with crates and suspension lugs. Scranton, Pa. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0425.

11—**Thiokol Chemical Corp.**, Woodbine, Ga. $1,898,190. 40mm CS cartridges (XM651-E1). Edgewood Arsenal, Md. DA-AA15-69-C-0700.

—**L. E. Mason Co.**, Hyde Park, Mass. $1,181,036 (contract modification). Nose body assemblies for incendiary bomb clusters (M36). Edgewood Arsenal, Md. DA-AA15-69-C-0169.

—**Kaiser Jeep Corp.**, Toledo, Ohio. $1,898,609 (contract modification). 5-ton trucks (M39 series). South Bend, Ind. Project Manager, Army General Purpose Vehicles Office, Warren, Mich. DA-AE06-68-C-0012.

—**Winston Ford Co., Inc.**, Prestonsburg, Ky. $4,266,761. Construction work at Carr Fork Reservoir Project, Ky., near Hazard, Ky. Army Engineer District, Louisville, Ky. DA-CW27-69-C-0076.

12—**General Motors Corp.**, Indianapolis, Ind. $1,883,331. XTG-250-1A transmission assemblies with oil filler kits for M551 Sheridan vehicles. Army Tank Automotive Command, Warren, Mich. DA-AE07-69-C-3436.

—**General Electric Co.**, Syracuse, N.Y. $9,100,000. Mobile High Power Acquisition Radar (HIPAR) for Nike Hercules Missile System. Army Missile Command, Huntsville, Ala. DA-AM01-68-A-0050.

—**Crown Construction Co.**, Columbus, Ga. $1,016,436. Construction of a two-story operations building with control tower, a hanger extension, a briefing administration building and a radio transmitter building at Fort Rucker, Ala. Army Engineer District, Mobile, Ala. DA-CA01-69-C-0073.

—**D. J. Barclay and Co., Inc.**, Gadsden, Ala. $1,822,875. Construction of an addition to a research and development building, Redstone Arsenal, Ala. Army Engineer District, Mobile, Ala. DA-CA01-69-C-0072.

—**List and Clark Construction Co.**, Overland Park, Kan. $2,132,794. Construction work at the Robert S. Kerr Lock and Dam Project, Arkansas River, near Keota, Okla. Army Engineer District, Tulsa, Okla. DA-CW56-69-C-0133.

13—**General Motors Corp.**, Indianapolis, Ind. $2,409,500. Transmission assemblies (XTG-411-2A) for M107 and M110 vehicles. Army Tank Automotive Command, Warren, Mich. DA-AE07-69-C-4376.

—**Chrysler Motor Corp.**, Warren, Mich. $1,241,338 (contract modification). 273 oneton cargo trucks and 49 ambulances. Army Tank Automotive Command, Warren, Mich. DA-AE07-69-C-0771.

—**International Harvester Co.**, Chicago, Ill. $1,063,572. Seven telephone maintenance and construction trucks, 45 maintenance trucks with platforms, and spare parts kits and technical publications. Army Tank Automotive Command, Warren, Mich. DA-AE07-69-C-4911.

—**Litton Systems, Inc.**, Woodland Hills, Calif. $1,390,700 (contract modification). AN/ASN-86 inertial navigational systems for Mohawk and RU-21 aircraft. Army Electronics Command, Fort Monmouth, N.J. DA-AB07-68-C-0345.

—**Fegles Construction and C & I Girdler, Inc.**, Minneapolis, Minn. $10,400,000. Construction of a munitions plant at the Newport Army Ammunition Plant, Newport, Ind. Army Engineer District, Chicago, Ill. DA-CA23-69-C-0020.

—**McElwee and Courbis Construction Co., Inc.**, Camden, N.J. $1,910,280. Construction work at the Sayers Dam Project, near Blanchard, Pa. Army Engineer District, Baltimore, Md. DA-CW31-69-C-0062.

—**AVCO Corp.**, Stratford, Conn. $3,131,015 (contract modification). T-53-L-13A and 701 gas turbine engines. Charleston, S.C., and Stratford. Army Aviation Systems Command, St. Louis, Mo. DA-AJ01-68-C-1874.

—**Applied Devices Corp.**, College Point, N.Y. $1,248,696. Modification kits for the Improved Hawk Similator, AN/TPQ-29. Army Missile Command, Huntsville, Ala. DA-AH01-69-C-1588.

16—**Chrysler Motor Corp.**, Centerline, Mich. $3,491,073. Various trucks. Army Tank Automotive Command, Warren, Mich. DA-AE07-69-C-4913.

—**McGraw Edison**, Bristol, Conn. $3,491,060. Mechanical time fuzes for artillery fuzes. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0351.

—**Page Communications Engineers, Inc.**, Washington, D.C. $2,511,385. Transportable microwave terminals for the Southeast Asia Radio Telephone Communications System. Army Electronics Command, Fort Monmouth, N.J. DA-AB07-69-C-0197.

17—**Cook Construction Co.**, Jackson, Miss. $6,448,535. Replacement of two railroad bridges, and one new span, across the Verdigras River, Wagoner County, Okla. Army Engineer District, Tulsa, Okla. DA-CW56-69-C-0134.

—**American Machine and Foundry Co.**, New York, N.Y. $5,096,000 (contract modification). Metal parts for 750-pound bombs. Garden City, N.Y., and other locations. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0035.

18—**Southern Airways of Texas, Inc.**, Fort Wolters, Tex. $36,138,755. Helicopter pilot training and maintenance of aircraft and related equipment. Army Purchasing and Contracting Office, Fort Wolters, Tex. DA-BD13-69-C-0012.

—**Eugene Luhr Co.**, Sacramento, Calif. $3,528,038. Channel improvement and bridge piers for a future crossing at Alameda Creek, near Fremont, Calif. Army Engineer District, San Francisco, Calif. DA-CW07-69-C-0053.

—**Hawthorne Aviation**, Fort Rucker, Ala. $2,439,384. Aircraft maintenance of fixed and rotary wing aircraft, and related test support services for the U.S. Army Test Board. Aberdeen Proving Grounds, Md. DA-AD05-69-C-0417.

20—**Eastman Kodak Co.**, Kingsport, Tenn. $6,004,873 (contract modification). Manufacture of various types of explosives. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-11-173-AMC-00035(A).

—**Atlas Chemical Industries, Inc.**, Wilmington, Del. $2,014,058 (contract modification). Production of TNT. Chattanooga, Tenn. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-11-173-AMC-00531(A).

—**Olin Mathieson Chemical Corp.**, New York, N.Y. $1,561,519 (contract modification). Manufacture of propellants. Baraboo, Wis. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0014.

—**Honeywell, Inc.**, Hopkins, Minn. $1,234,440 (contract modification). Fuzes for bomblets. New Brighton, Minn. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-68-C-0490.

—**John Wood Co.**, St. Paul, Minn. $1,103,807. 750-pound bomb fin assemblies, with crates and suspension lugs. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0424.

—**Stone, Marracini and Paterson, and Milton T. Pflueger**, San Francisco, Calif. $1,129,000. Preparation of a concept study for the new general hospital, Walter Reed Army Medical Center, Washington, D.C., including models and renderings. Washington, D.C. Army Engineer District, Baltimore, Md. DA-CA31-69-C-0111.

—**Glasgow Sand and Construction Co., and Ray Taylor and Rulo Sand and Gravel Co.**, Glasgow, Mo. $1,029,180. Stabilization of the Missouri River Bank. Army Engineer District, Kansas City, Mo. DA-CW41-69-C-0104.

23—**Sante Fe Engineers, Inc.**, Lancaster, Calif. $2,623,896. Construction of an addition to a hospital at Nellis AFB, Nev. Army Engineer District, Los Angeles, Calif. DA-CA09-69-C-0186.

—**Chrysler Corp.**, Centerline, Mich. $1,347,987. Industrial plant equipment for mobilization planning for medium tank production at the Detroit Tank Arsenal. Army Tank Automotive Command, Warren, Mich. DA-AE07-69-C-4363.

—**Bell Helicopter Co.**, Fort Worth, Tex. $1,076,280. Drive shaft assemblies for UH-1 Huey helicopters. Hurst, Tex. Army Aviation Systems Command, St. Louis, Mo. DA-AJ01-69-A-0314.

—**Hydromar Corp.**, Long Beach, Calif. $1,104,300. Dredging at the Channel Harbor entrance, Ventura, Calif. Army Engineer District, Los Angeles, Calif. DA-CW09-69-C-0076.

—**Mike Hooks, Inc.**, Lake Charles, La. $1,830,600. Maintenance dredging along the Calasieu River and Pass Project, Lake Charles, La. Army Engineer District, New Orleans, La. DA-CW69-69-C-0174.

—**Thiokol Chemical Corp.**, Bristol, Pa. $2,161,256 (contract modification). Loading, assembling and packing 105mm cartridges and 4.2mm signal illumination and spotting charges for M565 fuzes. Longhorn Army Ammunition Plant, Marshall, Tex. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-11-173-AMC-00200(A).

—**Bucyrus-Erie Co.**, Evansville, Ind. $3,409,765. 12½-ton crawler mounted crane shovels. Erie, Pa. Army Mobility Equipment Command, St. Louis, Mo. DA-AK01-69-C-0362.

—**Federal Cartridge Corp.**, Minneapolis, Minn. $1,680,735 (contract modification). Loading, assembling and packing 5.56mm and 7.62mm cartridges. Twin Cities Army Ammunition Plant, New Brighton, Minn. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-36-038-AMC-01099(A).

—**Physics International Co.**, San Leandro, Calif. $1,735,539 (contract modification). One-quarter-sized Marx generator for a high energy simulator. Defense Atomic Support Agency, Washington, D.C. DA-SA01-68-C-0175.

24—**Sylvania Electric Products, Inc.**, Mountain View, Calif. $1,329,783. Classified items. Central Procurement Activity, Warrenton, Va. DA-HC-69-C-0247.

—**Magnavox Co.**, Fort Wayne, Ind. $5,764,037. AN/GRC-106 radio sets. Philadelphia Procurement Division, Army Electronics Command, Philadelphia, Pa. DA-AB05-67-C-0166.

—**Curtiss-Wright Corp.**, East Paterson, N.J. $3,837,496. Mobile Tactical Imagry Interpretation Facilities (AN/TSQ-43) in expansible vans. Philadelphia Procurement Division, Army Electronics Command, Philadelphia, Pa. DA-AB05-68-C-1233.

—**General Electric Co.**, Utica, N.Y. $1,748,-

480. Chaparral guidance section depot equipment and related documentation and publications for new equipment training. Army Missile Command, Huntsville, Ala. DA-AH01-69-C-1905.

—**Bell Helicopter Co.**, Fort Worth, Tex. $1,348,776. Tail rotor gear boxes and transmission assemblies for OH-58A helicopters. Hurst, Tex. Army Aviation Systems Command, St. Louis, Mo. DA-AJ01-68-A-0188.

25—**Bell Helicopter Co.**, Fort Worth, Tex. $4,158,000 (contract modification). UH-1H helicopters. Hurst, Tex. Army Aviation Systems Command, St. Louis, Mo. DA-AJ01-69-C-0028.

—**Hughes Tool Co.**, Culver City, Calif. $2,247,000. Rotary wing blades for OH-6A helicopters. Army Aviation Systems Command, St. Louis, Mo. DA-23-204-AMC-03697.

—**FMC Corp.**, San Jose, Calif. $2,717,500 (contract modification). Continued production engineering, inspection, inspection engineering and maintenance analysis in support of the M113A self-propelled vehicle. San Farncisco Procurement Agency, Oakland, Calif. DA-04-200-AMC-02929.

—**Lear Siegler, Inc.**, Anaheim, Calif. $3,000,000. Classified electronic equipment. Army Electronics Command, Fort Monmouth, N.J.

—**Massachusetts Institute of Technology**, Cambridge, Mass. $1,035,500. Computer analysis in Behavioral Sciences. Defense Supply Service, Washington, D.C. DA-HC15-69-C-0347.

—**IBM Corp.**, Gaithersburg, Md. $1,154,769 (contract modification). Mobile logistics computer system. Needham, Mass., and Gaithersburg. Army Electronics Command, Washington Procurement Office, Alexandria, Va. DA-AB07-67-C-0408.

—**Magnavox Co.**, Urbana, Ill. $2,256,027. AN/GRC-103V radio sets. Army Electronics Command, Philadelphia, Pa. DA-AB05-69-C-1332.

—**KDI Precision Products, Inc.**, Cincinnati, Ohio. $1,347,300 (contract modification). Metal parts for 2.75 inch rocket fuzes. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0196.

—**Chamberlain Manufacturing Corp.**, New Bedford, Mass. $5,718,659 (contract modification). Metal parts for 155mm high explosive projectiles (M107). Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0238.

—**LTV Aerospace Corp.**, Warren, Mich. $2,720,000 (contract modification). Industrial services for the Lance missile system. Army Missile Command, Huntsville, Ala. DA-20-113-AMC-01052.

—**Philco-Ford Corp.**, Newport Beach, Calif. $2,650,000. Extension of FY 1969 engineering services contract for the Shillelagh missile system. Army Missile Command, Huntsville, Ala. DA-AH01-69-C-0684.

—**Midvale-Heppenstall Co.**, Philadelphia, Pa. $1,618,400. Tube forgings for 175mm guns (M113E1). Watervliet Arsenal, Watervliet, N.Y. DA-AF07-69-C-0255.

26—**Gibbs Manufacturing and Research Corp.**, Janesville, Wis. $1,763,200 (contract modification). Fuzes for 2.75 inch rockets. Army Ammunition and Supply Agency, Joliet, Ill. DA-AA09-69-C-0104.

—**Kaiser Jeep Corp.**, Toledo, Ohio. $1,025,550. One-ton cargo trucks. Army Tank Automotive Command, Warren, Mich. DA-AE07-69-C-4921.

—**General Motors Corp.**, Detroit, Mich. $1,856,917. 8V71-T diesel engines for M109 self-propelled howitzers. Army Tank Automotive Command, Warren, Mich. DA-AE07-69-C-4896.

—**General Motors Corp.**, Indianapolis, Ind. $1,300,495. Breech mechanism assemblies for 152mm gun launchers (M81E1). Watervliet Arsenal, Watervliet, N.Y. DA-AF07-69-C-0362.

—**Link Belt Feeder Div., FMC Corp.**, Cedar Rapids, Iowa. $1,388,280. Self-propelled pile driver hammers. Army Mobility Command, St. Louis, Mo. DA-AK01-69-CA630.

—**Westinghouse Air Brake Co.**, Peoria, Ill. $2,468,895 (contract modification). Diesel engined road graders. Indianapolis, Ind. Army Mobility Equipment Command, St. Louis, Mo. DA-23-195-AMC-01083(T).

—**United Aircraft Corp.**, Stratford, Conn. $2,553,709. Design, fabrication, installation and testing of a roller gear transmission system for the S-61 helicopter. Aviation Materiel Laboratory, Fort Eustis, Va. DA-AJ02-69-C-0042.

—**Philco-Ford Corp.**, Philadelphia, Pa. $4,456,791. Engineer, furnish, install, test and make operational, and provide one year's operation and maintenance of a telecommunications system on Taiwan and Okinawa. Army Electronics Command, Fort Monmouth, N.J. DA-AB07-69-C-0409.

—**Stevens Manufacturing Co.**, Ebensburg, Pa. $2,341,602 (contract modification). Four-wheel semi-trailers. DA-AE07-69-C-1443. $1,021,215 (contract modification). 400-gallon water tank trailers. DA-AE07-69-C-1461. Army Tank Automotive Command, Warren, Mich.

27—**Hamilton Watch Co.**, Lancaster, Pa. $2,517,000. Mark 15 rear-fitting safety devices for artillery proximity fuzes. Harry Diamond Laboratory, Washington, D.C. DA-AG39-68-C-0039.

—**Tower Construction, Inc.**, Honolulu, Hawaii. $1,039,902. Construction of an Air National Guard communications center and automotive maintenance shop, Hickam AFB, Oahu. Army Engineer District, Honolulu, Hawaii. DA-CA83-69-C-0026.

—**Philco-Ford Corp.**, Newport Beach, Calif. $2,542,964. Chaparral depot ground support equipment and depot maintenance. Newport Beach and Anaheim, Calif. Army Missile Command, Huntsville, Ala. DA-AH01-69-C-1940.

—**Continental Motors Corp.**, Mobile, Ala. $9,018,403. Remanufacture of multi-fuel engine assemblies (LDS465-1). Army Tank Automotive Command, Warren, Mich. DA-AE07-69-C-5296.

—**Radio Corp. of America**, Burlington, Mass. $1,464,750 (contract modification). Research and development effort on Land Combat Support System (LCSS). Army Missile Command, Huntsville, Ala. DA-AH01-69-C-1437.

—**Texas Instruments, Inc.**, Dallas, Tex. $1,315,000. Classified. Mobility Equipment Research and Development Center, Fort Belvoir, Va. DA-AK02-69-C-0603.

—**Motorola, Inc.**, Scottsdale, Ariz. $2,848,125. Special test equipment and ancillary items, drawings and technical publications for AN/APS-94D radar sets. Army Electronics Command, Fort Monmouth, N.J. DA-AB07-68-C-0419.

—**Raytheon Co.**, Andover, Mass. $12,940,552. Line items for Improved Hawk missile ground support equipment. Andover and Waltham, Mass. DA-AH01-69-C-1313. $7,983,000. Tactical telemetry kits and Improved Hawk missile assemblies. DA-AH01-67-C-1312. Army Missile Command, Huntsville, Ala.

—**Morrison Knudsen Co., Inc.**, Seattle, Wash. $11,647,324. Installation of main-line welded rail and secondary line on the Great Northern Railroad. Lincoln County, Mont. Army Engineer District, Seattle, Wash. DA-CW67-69-C-0052.

—**Emerson Electric Co.**, St. Louis, Mo. $1,234,949 (contract modification). Repair parts for the XM28 armament subsystem for 7.62mm machine guns and 40mm grenade launchers. Army Procurement Agency, Chicago, Ill. DA-AF03-69-C-0025.

—**General Electric Co.**, Burlington, Vt. $1,777,334. Armament sub-system for Huey-Cobra helicopters and Vulcan 20mm automatic guns. Army Procurement Agency, New York, N.Y. DA-AF03-69-C-0004.

—**Day and Zimmerman, Inc.**, Philadelphia, Pa. $3,032,703 (contract modification). Loading, assembling and packing ammunition and related components, Lone Star Army Ammunition Plant, Texarkana, Tex. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-11-173-AMC-00114(A).

—**National Gypsum Co.**, Buffalo, N.Y. $1,366,230 (contract modification). Loading, assembling and packing ammunition, Army Ammunition Plant, Parsons, Kan. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-11-173-AMC-00095(A).

—**Olin Mathieson Chemical Corp.**, New York, N.Y. $1,537,416 (contract modification). Loading, assembling and packing propellants, Army Ammunition Plant, Charlestown, Ind. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0148.

—**Chamberlain Manufacturing Corp.**, Waterloo, Iowa. $1,590,243. Metal parts for 105mm smoke projectiles. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0383.

—**Gentex Corp.**, Carbondale, Pa. $2,047,473. SPH/4 helmets. Army Procurement Agency, New York, N.Y. DA-AG25-69-C-0881.

30—**General Motors Corp.**, Detroit, Mich. $9,197,235. Metal parts for 105mm projectiles. Army Ammunition Plant, St. Louis, Mo. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0108.

—**Kisco Co., Inc.**, St. Louis, Mo. $5,937,750. Metal parts for 105mm cartridge cases. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0043.

—**E. I. DuPont de Nemours and Co.**, Wilmington, Del. TNT. Barksdale, Wis. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0327.

—**General Instrument Corp.**, Chicopee, Mass. $1,011,809. Metal parts for tail fuzes for 750-pound bombs. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0442.

—**Bell Aeropace Corp.**, Fort Worth, Tex. $2,027,391 (contract modification). OH-13S helicopters. DA-AJ01-69-C-0511. $1,437,591. Repair parts and special tools for OH-58A helicopters. DA-AJ01-68-C-1699. Hurst, Tex. Army Aviation Systems Command, St. Louis, Mo.

—**Boeing Co., Morton, Pa.** $1,286,139. CH-47C helicopter modification kits. DA-AJ01-68-A-0005. $1,150,708. Shop supplies, tools and modification kits for CH-47 rotor blades. DA-AJ01-68-A-0005. Army Aviation Systems Command, St. Louis, Mo.

—**Henry Spen and Co., Inc.**, Brooklyn, N.Y. $3,432,657. General purpose 4-ton trailers. Army Truck Automotive Command, Warren, Mich. DA-AE07-69-C-5307.

—**General Motors Corp.**, Indianapolis, Ind. $1,100,000. Evaluation, product improvement, fabrication and testing of the automatic loader of the Main Battle Tank (XM70). DA-20-113-AMC-08843(T). $1,000,000. System integration and configuration management for advance production engineering, Main Battle Tank. DA-AE07-69-C-4897. $1,100,000. Long lead time procurement of miscellaneous hardware for the advance production engineering of the Main Battle Tank. DA-AE07-69-C-5272. Work will be done at Warren, Mich., and Milwaukee, Wis. Army Tank Automotive Command, Warren, Mich.

—**AMTRON, Inc.**, Midlothion, Ill. $5,890,000. Switchboards (SB-3082/GT). Army Electronics Command, Fort Monmouth, N.J. DA-AB07-69-C-0028.

—**Honeywell, Inc.**, Tampa, Fla. $2,000,000. Classified. Army Electronics Command, Fort Monmouth, N.J. DA-AB07-69-C-0412.

—**Collins Radio Co.**, Cedar Rapids, Iowa. $1,666,682. Direction finder sets (ARN-83), radio receivers (R-1391/ARN-83), controls and mountings. Army Electronics Command, Fort Monmouth, N.J. DA-AB07-69-C-0387.

—**J. I. Case Co.**, Racine, Wis. $3,157,961. Scoop loaders. Terre Haute, Ind., Racine, Wis., and Burlington, Iowa. Army Mobility Equipment Command, St. Louis, Mo. DA-AK01-69-C-A817.

—**Davey Compressor Co.**, Kent, Ohio. $1,096,615. Trailer mounted compressors. Army Mobility Equipment Command, St. Louis, Mo. DA-AK01-69-C-A835.

—**Allis Chalmers Manufacturing Co.**, West Allis, Wis. $1,194,305. Fork lift trucks. Harvey, Ill. Army Mobility Equipment Command, St. Louis, Mo. DA-AK01-69-C-A805.

—**Litton Systems, Inc.**, Van Nuys. Calif. $3,374,400. Data converter coordinated air defense systems. Van Nuys and Salt Lake City, Utah. Army Missile Command, Huntsville, Ala. DA-AH01-69-C-0025.

—**General Dynamics**, Pomona, Calif. $2,252,586. Advanced sensor development (research and development). DA-AH01-69-C-1929. $1,900,000. Development of an advanced passive-optical seeker in support of the advance development phase of the advanced forward area air defense system. DA-AB01-69-C-1944. Army Missile Command, Huntsville, Ala.

—**Raytheon Co.**, Norwood, Mass. $4,497,347. Multiplexers with running spares. North Dighton, Mass. Army Procurement Agency, New York, N.Y. DA-AB05-69-C-1012.

—**Ovitron Corp.**, Newburgh, N.Y. $3,355,526. AN/PRC-25 radio sets and RT-505/PRC-25 receiver transmitters. Army Electronics Command, Philadelphia, Pa. DA-AB05-69-C-1334.

—**Continental Heller Corp.**, Sacramento, Calif. $3,068,000. Construction of warehouses, support offices, a storm reservoir and storm drains, relocation of the railroad, and miscellaneous work, Defense Depot, Tracy, Calif. Army Engineer District, Sacramento, Calif. DA-CA05-69-C-0130.

—**H. L. Bishop, Inc.**, Westhampton Beach, N.Y. Construction of four groins and placement of dredged sand fill, near Westhampton Beach, in connection with the Fire Island Inlet to Montauk Point Beach Erosion and Hurricane Project, N.Y. Army Engineer District, New York, N.Y. DA-CW51-69-C-0028.

—**List and Clark Construction Co.**, Overland Park, Kan. $2,316,524. Construction of a levee embankment in connection with the Chariton River Flood Control Project, Mo. Army Engineer District, Kansas City, Mo. DA-AK02-69-C-0603.

—**McMath-Trussell Construction Co.**, Columbus, Ga. $1,592,617. Improvement on post road, Fort Benning, Ga. Army Engineer District, Savannah, Ga. DA-CA21-69-C-0134.

—**Whittmore-Reiman Construction**, Pueblo, Colo., and **Reiman-Wuerth Co.**, Cheyenne, Wyo. $1,456,770. Construction of two bachelor officers quarters, including site work and utilities, Fort Carson, Colo. Army Engineer District, Omaha, Neb. DA-CA45-69-C-0102.

—**Milgo Electronic Corp.**, Miami, Fla. $1,-313,335. Instrumentation radar system. Los Angeles Procurement Agency, Pasadena, Calif. DA-AG07-69-C-0871.

—**Western Pacific Dredging Corp.**, Portland, Ore. $1,478,600. Dredging of the Ventura Marina, Ventura, Calif. Army Engineer District, Los Angeles, Calif. DA-CW09-69-C-0083.

—**Texas Instrument, Inc.**, Dallas, Tex. $2,-443,150 (contract modification). Classified. Dallas and Sherman, Tex. Research and Development Center, Army Mobility Equipment Command, Fort Belvoir, Va. DA-AK02-69-C-0603.

—**L. A. Barton and Co.**, Hamel, Ill. $1,390,-288. Reconstruction and addition to an airfield apron, Blytheville AFB, Ark. Army Engineer District, Fort Worth, Tex. DA-CA63-69-C-0186.

—**White Motor Corp.**, Lansing, Mich. $1,-224,221. 2½-ton trucks. Project Manager, General Purpose Vehicles, Michigan Army Missile Plant, Warren, Mich. DA-AE06-69-C-0003.

—**General Time Corp.**, La Salle, Ill. $1,292,-827. Mechanical time fuzes for 105mm cartridges. Frankford Arsenal, Philadelphia, Pa. DA-AA25-69-C-0604.

—**Charles J. Craig Construction Co.**, Columbia, S.C. $1,044,000. Construction of Armed Forces Entrance and Examination Station with supporting facilities, Fort Jackson, S.C. Army Engineer District, Savannah, Ga. DA-CA21-69-C-0131.

—**Tuckman-Barbee Construction, Inc.**, Washington, D.C. $1,713,025. Construction of a two-story medical research facility, Walter Reed Medical Center, Md. Army Engineer District, Baltimore, Md. DA-CA31-69-C-0122.

—**A. Teichert and Sons, Inc.**, Irwindale, Calif. $1,170,370. Construction of a concrete channel for Rose Creek Project, San Diego County, Calif. Army Engineer District, Los Angeles, Calif. CA-CW09-69-C-0080.

—**PRD Electronics, Inc.**, Syosset, N.Y. $1,-094,524. Container assemblies and equipment for meteorology calibration of missiles. Westbury, N.Y. Army Procurement Agency, Cincinnati, Ohio. CA-AG31-69-C-0875.

—**E. I. DuPont de Nemours, Inc.**, Wilmington, Del. $4,537,429. Design criteria and production of equipment to provide and operate five TNT production lines, Newport Ammunition Plant, Newport, Ind. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-68-C-0414.

—**Hamilton Watch Co.**, Lancaster, Pa. $1,-898,800. Mk 15, Mod O rear fitting safety devices for fuzes. Harry Diamond Laboratory, Washington, D.C. DA-AG39-69-C-0058.

—**Eastman Kodak Co.**, Gates, N.Y. $1,981,-050. Mk 15 Mod O rear fitting safety devices for fuzes. Harry Diamond Laboratory, Washington, D.C. DA-AG39-69-C-0059.

—**Raytheon Co.**, Bristol, Tenn. $2,725,580. Artillery ammunition proximity fuzes. Harry Diamond Laboratory, Washington, D.C. DA-AG39-69-C-0060.

—Fairchild **Space and Defense System**, Capiabue, N.Y. $1,414,270. Artillery ammunition proximity fuzes. Harry Diamond Laboratory, Washington, D.C. DA-AG39-69-C-0061.

—**Gervis B. Webb Co.**, Atlanta, Ga. $1,679,-242. Materials handling system and storage modernization system. South Gate, Calif., and Detroit, Mich. Red River Army Depot, Texarkana, Tex. DA-AG47-69-C-0083.

—**Varo, Inc.**, Garland, Tex. $1,780,021. Miniaturized night vision sights. Army Electronics Command, Fort Monmouth, N.J. DA-AB07-69-C-0451.

—**Page Aircraft Maintenance, Inc.**, Lawton, Okla. $39,334,623 (contract modification). Continued provision of all organizational, direct and general support maintenance and scheduled inspections of fixed and rotary wing aircraft. Fort Rucker, Ala. Army Purchasing and Contracting Division, Fort Rucker, Ala. DA-BC01-69-C-0003.

—**Darco Construction Co.**, College Station, Tex. $1,397,430. Construction along the Martinez Creek, San Antonio, Tex., in connection with the San Antonio Channel Improvement Project. Army Engineer District, Forth Worth, Tex. DA-CW63-69-C-0080.

—**Lockheed Aircraft Co.**, Plainfield, N.J. $1,847,853. Line items of repair parts, radar sets and test sets for the Vulcan Air Defense System. Army Procurement Agency, New York, N.Y. DA-AG25-69-C-0356.

—**Tri-State Roofing Co. of Ohio**, Parkersburg, W. Va. $1,044,100. Replace roofs, roof drains and gutters on five warehouse buildings, Defense Construction Supply Center, Columbus, Ohio. Army Engineer District, Louisville, Ky. DA-CA27-69-C-0055.

—**Construction, Ltd.** Bordentown, N.J. $1,-498,000. Construction of a basic combat training facility, Fort Dix, N.J. Army Engineer District, New York, N.Y. DA-CA51-69-C-0153.

—**Litton Systems, Inc.**, Woodland Hills, Calif. $1,946,980 (contract modification). Inertial navigational systems for the Mohawk and U-21 aircraft. Army Electronics Command, Fort Monmouth, N.J. DA-AB07-68-C-0345.

—**Westinghouse Electric Corp.**, Pittsburgh, Pa. $1,440,000. Balanced pressure systems and ancillary items. Army Mobility Equipment Research and Development Center, Fort Belvoir, Va. DA-AK02-69-C-0666.

—**Ross Aviation, Inc.**, Fort Rucker, Ala. $5,-410,305 (contract modification). Rotary instrument training, fixed wing primary training and fixed wing instrument training. Fort Rucker and Fort Stewart, Ga. Purchasing and Contracting Officer, Fort Rucker, Ala. DA-BC01-67-C-0173.

—**Hawthorne Aviation Co.**, Fort Sill, Okla. $1,078,417 (contract modification). Nonpersonal services for the performance of maintenance requirements for all aircraft at Fort Sill, and maintenance support for associated equipment, including navigational and avionics equipment, and the ground control system. Field Artillery Center, Fort Sill, Okla. DA-BD05-68-C-0044.

—**Pullman, Inc.**, Chicago, Ill. $7,266,490 (contract modification). Semi-trailer chassis. Freemont, Calif. Army Tank Automotive Command, Warren, Mich. DA-AE07-69-C-1103.

—**Henry J. Kaiser Co.**, Oakland, Calif. $2,-158,500. Modernization and engineering analysis of Munitions Command, GOCO ammunition production plants. Picatinny Arsenal, Dover, N.J. DA-AA21-69-C-0788.

—Demar **Construction Co.**, El Paso, Tex. $1,-274,280. Construction of a range facility, White Sands Missile Range, N.M. Army Engineer District, Albuquerque, N.M. DA-CA-47-69-C-0117.

—**Kanarr Corp.**, Kingston, Pa. $1,096,290 (contract modification). M79 40mm grenade launchers. Army Weapons Command, Rock Island Arsenal, Ill. DA-AF03-69-C-0084.

—**Computer Sciences Corp.**, Silver Spring, Md. $1,600,000. Automatic data processing services for the Army Materiel Command. St. Louis, Mo. Army Aviation Systems Command, St. Louis, Mo. DA-AJ01-69-C-0948.

—**Federal Electric Corp.**, Paramus, N.J. $1,-250,000. Engineer, furnish, install and make operational an integrated microwave line-of-sight telecommunications system in the Federal Republic of Germany. Army Electronics Command, Fort Monmouth, N.J. DA-AB07-69-C-0464.

—**Martin Marietta Corp.**, Orlando, Fla. $1,-756,130. Multiplexers and channel cable containers. Ocala, Fla. Army Electronics Command, Philadelphia, Pa. DA-AB05-69-C-1045.

—**General Motors Corp.**, Indianapolis, Ind. $1,501,810. Transmission assemblies for the M107 combat vehicle. Army Tank Automotive Command, Warren, Mich. DA-AE07-69-C-4927.

—**Motorola, Inc.**, Scottsdale, Ariz. $1,079,655. Research and development for a feasibility contract in connection with Terrain Avoidance Radar (TAR). Army Electronics Command, Fort Monmouth, N.J. DA-AB07-69-C-0395.

—**Pacific Ventures**, Inc., Seattle, Wash. $1,-181,600. Alteration and repair of various buildings, and street and area lighting, Fort Lewis, Wash. Army Engineering District, Seattle, Wash. DA-CA67-69-C-0039.

—**Magnavox Co.**, Fort Wayne, Ind. $2,975,-884. AN/GRC-106 vehicle radio sets. Army Electronics Command, Philadelphia, Pa. DA-AB05-67-C-0166.

—**Martin Marietta Corp.**, Orlando, Fla. $1,-452,921. Multiplexers and channel cable combiners. Ocala, Fla. Army Electronics Command, Philadelphia, Pa. DA-AB05-69-C-1045.

—**Electromagnetic Technology Corp.**, Montgomeryville, Pa. $1,176,750. Line items of repair parts for AN/VTS-2 radar sets for the Vulcan Air Defense System. Frankford Arsenal, Philadelphia, Pa. DA-AA25-69-C-0678.

—**Honeywell, Inc.**, Tampa, Fla. $1,000,000. (contract modification). Classified. Army Electronics Command, Fort Monmouth, N.J. DA-AB07-69-C-0412.

—**Sperry Rand Corp.**, New York, N.Y. $28,-259,984 (contract modification). Load, assemble and pack various ammunition items. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-11-173-AMC-00080(A).

—**Hercules, Inc.**, Wilmington, Del. $7,389,-907. Propellant production at Sunflower Army Ammunition Plant, Lawrence, Kan. DA-11-173-AMC-00042(A). $1,526,256. Propellant production at the Army Ammunition Plant, Radford, Va. DA-11-173-AMC-00037(A). Army Ammunition Procurement and Supply Agency, Joliet, Ill.

—**Olin Mathieson Chemical Corp.**, New York, N.Y. $6,419,154 (contract modification). Propellant production at the Badger Army Ammunition Plant, Baraboo, Wis. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-AA09-69-C-0014.

—**Atlas Chemical Industries, Inc.**, Wilmington, Del. $5,835,914 (contract modification). TNT production at the Volunteer Army Ammunition Plant, Chattanooga, Tenn. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-11-173-AMC-00531(A).

—**Remington Arms Co.**, Bridgeport, Conn. $5,153,905 (contract modification). Load, assemble and pack small caliber ammunition, Lake City Army Ammunition Plant, Independence, Mo. DA-49-010-AMC-00003(A). $3,093,806 (contract modification). Load, assemble and pack small caliber ammunition, Lake City plant. DA-49-010-AMC-0003(A).

—**Eastman Kodak Co.**, Kingsport, Tenn. $4,-408,057 (contract modification). Production of various explosives, Holston Army Ammunition Plant, Kingsport, Tenn. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-11-173-AMC-00035(A).

—**Firestone Tire and Rubber Co.**, Akron, Ohio. $3,846,050 (contract modification). Load, assemble and pack ammunition, Army Ammunition Plant, Ravenna, Ohio. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-11-173-AMC-00065(A).

—Harvey **Aluminum** Sales, Inc., Torrance, Calif. $1,963,233 (contract modification). Load, assemble and pack large caliber ammunition, Army Ammunition Plant, Milan, Tenn. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-11-173-AMC-00520(A).

—**Mason and Hanger-Silas Mason Co.**, Lexington, Ky. $5,124,178 (contract modification). Load, assemble and pack bombs and projectiles, Cornhusker Army Ammunition Plant, Grand Island, Neb. DA-AA09-69-C-0383. $1,591,084 (contract modification). Load, assemble and pack ammunition, Iowa Army Ammunition Plant, Burlington, Iowa. DA-AA09-68-C-0383. Army Ammunition Procurement and Supply Agency, Joliet, Ill.

—Uniroyal, Inc., New York, N.Y. $1,307,-301 (contract modification). TNT and other explosives production. Army Ammunition Plant, Joliet, Ill. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-11-173-AMC-00062(A).

—**Day and Zimmerman & Co.**, Philadelphia, Pa. $1,945,106 (contract modification), and $1,170,497 (contract modification). Load, assemble and pack ammunition. Lone Star Army Ammunition Plant, Texarkana, Tex. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA-11-173-AMC-00114(A).

DEPARTMENT OF THE NAVY

2—**Dynaletron Corp.**, Washington, D.C. $1,153,915. Aircraft maintenance services in connection with operational support of missile and space programs at the Pacific Missile Range. Naval Air Station, Point Mugu, Calif. Naval Purchasing Office, Los Angeles, Calif. N00123-69-C-0515.

—**Kollsman Instrument Corp.**, Elmhurst, N.Y. $1,023,281 (contract modification). Altimeter encoders for the Navy and Air Force. Naval Air Systems Command, Washington, D.C. N00019-68-C-0409.

5—**Johns Hopkins University**, Silver Springs, Md. $2,931,500. Increased level of effort in advanced research on surface missile systems. Naval Ordnance Systems Command, Washington, D.C. NOw 62-604-C.

—**Coneen Construction Corp.**, El Cajon, Calif. $1,507,000. Construction of barracks, Naval Station, San Diego, Calif. Naval Facilities Engineering Command, Washington, D.C. N62473-68-C-0111.

—**General Time Corp.**, Skokie, Ill. $1,350,492 (contract modification). Rockeye II mechanical time fuzes, plus shipping and storage containers. Naval Air Systems Command, Washington, D.C. N00019-69-C-0154.

—**B.F. Gosser, Inc.**, Gardena, Calif. $1,110,639. Construction of additions to noncommissioned officers' club, Naval Station, Long Beach, Calif. Naval Facilities Engineering Command, Washington D.C. N62473-69-C-0008.

6—**Computer Measurements Co.**, San Fernando, Calif. $3,326,742. Manufacture transistorized electronic counters. Naval Electronic Systems Command, Washington, D.C. N00039-69-C-2604.

—**William E. Arnold Co.**, Jacksonville, Fla. $3,087,000. Construction of aircraft maintenance hanger, Naval Air Station, Cecil Field, Fla. Naval Facilities Engineering Command, Washington, D.C. N62467-68-C-0161.

9—**General Electric Co.**, Washington, D.C. $2,717,927. Guidance assemblies for Mk 3 Poseidon missiles. Naval Strategic Systems Project Office, Washington, D.C. N00030-69-C-0219.

—**General Dynamics Corp.**, Pomona, Calif. $1,265,000. Terrier, Tartar and Standard missiles. Naval Ordnance Systems Command, Washington, D.C. N00017-68-C-2205.

10—**Raytheon Co.**, Lowell, Mass. $3,676,212 (contract modification). Guidance and control groups for Sidewinder 1C missiles. Naval Air Systems Command, Washington, D.C. N00019-69-C-0056.

—**Kaminer Construction Corp.**, Chamblee, Ga. $1,857,000. Utilities for aircraft carrier berths, Naval Station, Mayport, Fla. Naval Facilities Engineering Command, Washington, D.C. N62467-67-0463.

11—**General Dynamics Corp.**, Groton, Conn. $5,625,000. Design, develop, fabricate and furnish classified electronic equipment for submarines. Naval Ship Systems Command, Washington, D.C. N00024-69-C-1333.

—**Litton Systems, Inc.**, College Park, Md. $3,897,855. Target detecting devices and associated data. Naval Air Systems Command, Washington, D.C. N00019-69-C-0646.

—**United Aircraft Corp.**, Pratt and Whitney Aircraft Div., East Hartford, Conn. $2,670,000 (contract modification). Product support engineering services for T34, TF33/JT3D and J-75/J-74 series engines for the Air Force. N00019-69-C-0367. $3,510,000. Production of YTF30-P-412 engines and conversion of TF30-P-12 engines to the YTF30-P-412 configuration. N00019-69-C-0614. Naval Air Systems Command, Washington, D.C.

—**Texas Instruments, Inc.**, Dallas, Tex. $1,376,920 (contract modification). Airborne magnetic detecting sets. Naval Air Systems Command, Washington, D.C. N00019-69-C-0412.

—**General Electric Co.**, Binghampton, N.Y. $1,424,653 (contract modification). Increase limitation of authorization for AN/ASA-32J automatic flight control systems for the Air Force. Naval Air Systems Command, Washington, D.C. N00019-69-C-0077.

12—**Newport News Shipbuilding and Dry Dock Co.**, Newport News, Va. $3,436,000. Advanced planning, design and other preparatory work for conversion of USS Nathanael Green (SSBN 636) to C-3 Poseidon missile capability. Naval Ship Systems Command, Washington, D.C. N00024-69-C-0231.

—**Massachusetts Institute of Technology**, Cambridge, Mass. $1,670,000 (contract modification). Continuation of design work on the Polaris guidance system. Naval Strategic Systems Project Office, Washington, D.C. N00030-68-C-0154 P002.

—**Garrett Corp.**, Phoenix, Ariz. $2,077,011. Spare parts for CTCP 100-54 and GTC 85, 56 and 72 gas turbines for F-4 and A-5 aircraft. Naval Aviation Supply Office, Philadelphia, Pa. N00383-67-A-2301-0629.

13—**DeLaval Turbine, Inc.**, Trenton, N.J. $2,550,000. Fuel oil pumps and associated equipment and data for the Standard Distillate Fuel Program. Naval Ship Systems Command, Washington, D.C. N00024-69-C-5377.

—**F. A. Duke Co., Inc.**, Portsmouth, Va. $2,531,613. Construction of aircraft integration and test hangar, Naval Air Station, Norfolk, Va. Naval Facilities Engineering Command, Washington, D.C. N62470-69-C-0742.

—**Woods Hole Oceanographic Institution**, Woods Hole, Mass. $2,272,972. Oceanographic studies. Office of Naval Research, Washington, D.C. N00014-66-C-0241 Mod G07.

—**Philco Ford Corp.**, Willow Grove, Pa. $1,400,000. Command data display groups. Naval Purchasing Office, Los Angeles, Calif. N00123-69-C-0815.

—**Hartman Systems Co., Inc.**, Huntington Station, N.Y. $1,260,000. 35 navigational plotting systems, pre-production equipment, and associated training and technical data. Naval Ships Systems Command, Washington, D.C. N00024-69-C-5517.

—**Massachusetts Institute of Technology**, Cambridge, Mass. $1,500,000. Additional research on computer theory and communications techniques. Office of Naval Research, Washington, D.C. NONR 4102 (01).

16—**Bendix Corp.**, Baltimore, Md. $4,538,177 (contract modification). Airborne receiver transmitters and associated equipment. Naval Air Systems Command, Washington, D.C. NOw 66-0637.

—**Collins Radio Co.**, Richardson, Tex. $3,186,666 (contract modification). Airborne VLF communications systems. Naval Air Systems Command, Washington, D.C. N00019-67-C-0382.

—**Litton Systems, Inc.**, Silver Spring, Md. $2,359,153. Countermeasure transmitting sets and ancillary items for the Air Force. Naval Air Systems Command, Washington, D.C. N00019-69-C-0611.

—**General Dynamics Corp.**, Pomona, Calif. $1,232,273 (contract modification). Incremental funding for research and development on the Standard ARM missile. Naval Air Systems Command, Washington, D.C. N00019-68-C-0400.

—**Lockheed Aircraft Corp.**, Sunnyvale, Calif. $2,500,000. Poseidon Advance Guidance Development Support Program. Naval Strategic Systems Project Office, Washington, D.C. N00030-69-C-0100.

—**Christenson-Raber Kief and Associates**, Seattle, Wash. $2,163,290. Construction of aircraft parking apron, Naval Air Station, Whidbey Island, Wash. Naval Facilities Engineering Command, Washington, D.C. N62476-69-C-0022.

—**Wexler Construction Co., Inc.**, Newton Highlands, Mass. $1,292,235. Construction of Armed Forces Reserve Training Center, Lawrence, Mass. Naval Facilities Engineering Command, Washington, D.C. N62464-67-C-0005.

—**Bendix Corp.**, Teterboro, N.J. $1,115,000. Mobile adapters used in conjunction with AN/GSM 133 automatic program test sets for overhaul and repair of F-4 series aircraft. Naval Purchasing Office, Los Angeles, Calif. N00123-69-C-1392.

19—**Sippican Corp.**, Marion, Mass. $10,044,044. Expendable bathythermograph equipment, including probes, recorders, launchers and spare parts. Naval Ship Systems Command, Washington, D.C. N00024-69-C-1386.

—**Sperry Rand Corp.**, St. Paul, Minn. $5,799,191 (contract modification). AN/ASQ avionic computers for P-3C aircrtaft. Naval Air Systems Command, Washington, D.C. N00019-69-C-0295.

—**Sylvania Electric Products, Inc.**, Needham Heights, Mass. $1,295,439. Design and development of a Real Time Digital Signal Processor System. Naval Air Development Center, Johnsville, Pa. N62269-69-C-0206.

—**North American Rockwell Corp.**, Columbus, Ohio. $1,012,000. Design, development, fabrication and test of a Naval Intelligence Processing System. Naval Air Systems Command, Washington, D.C. N00019-68-C-0525.

23—**Singer-General Precision Inc.**, Wayne, N.J. $1,057,000 (contract modification). Research on guidance systems for Poseidon missiles. Naval Strategic Systems Project Office, Washington, D.C. N00030-69-C-0086.

24—**Hazeltine Corp.**, Little Neck, N.Y. $9,932,997. Airborne interrogator sets for the Navy and Air Force. Naval Air Systems Command, Washington, D.C. N00019-69-C-0538.

—**General Electric Co.**, Utica, N.Y. $6,444,422 (contract modification). AN/AYA-8 data processing systems for P-3C aircraft. Naval Air Systems Command, Washington, D.C. N00019-69-C-0270.

—**United Aircraft Corp.**, East Hartford, Conn. $5,716,890 (contract modification). J52-P-8A engines. Naval Air Systems Command, Washington, D.C. N00019-67-C-0182.

—**Stromberg Datagraphics, Inc.**, San Diego, Calif. $2,065,372 (contract modification). Airborne tactical display systems. Naval Air Systems Command, Washington, D.C. N00019-69-C-0302.

—**Raytheon Co.**, Lexington, Mass. $2,743,420 (contract modification). Guidance and control groups for the Chaparral missile. Lowell, Mass. N00019-69-C-0200. $1,232,056 (contract modification). Incremental funding for Sparrow III missiles. Bedford, Mass. N00019-67-C-0019. $18,734,623 (contract modification). Guidance and control groups for Sparrow III missiles. Lowell, Mass., Bristol. Tenn., and Oxnard, Calif. N00019-69-C-0358. Naval Air Systems Command, Washington, D.C.

—**T. L. James and Co., Inc.**, Ruston, La. $1,424,490. Taxiway rehabilitation and runway repairs, Air National Guard Permanent Training Site, Municipal Airport, Gulfport, Miss. Naval Facilities Engineering Command, Washington, D.C. N62468-69-C-0200.

25—**G. L. Cory, Inc.**, San Diego, Calif. $3,642,580. Construction of an avionics facility for the Naval Air Rework Facility, North Island Naval Air Station, Calif. Naval Facilities Engineering Command, Washington, D.C. N62473-68-C-0135.

—**Singer General Precision Corp.**, Silver Spring, Md. $3,000,000. Dual position anti-submarine acoustic sensor operator trainers, VP DIFAR 2 device 14B38. Naval Training Device Center, Orlando, Fla. N61339-69-C-0260.

—**D and A Equipment Co., Inc.**, Pensacola, Fla. $2,648,000. Construction of a dispensary and dental clinic, Naval Training Center, Orlando, Fla. Naval Facilities Engineering Command, Washington, D.C. N62467-67-C-0183.

—**Construction Services Co., Inc.**, Isle of Palms, S.C. $1,267,778. Construction of a dispensary, Marine Corps Recruit Depot, Parris Island, S.C. Naval Facilities Engineering Command, Washington, D.C. N62467-67-C-0671.

26—**FMC Corp.**, Minneapolis, Minn. $4,452,000. Increase of limitation of authorization for combined Guided Missile Launcher System Mark 26, Mods 0, 1 and 2. Fridley, Minn. Naval Ordnance Systems Command, Washington, D.C. N00017-68-C-2109.

—**Fred A. Arnold, Inc.,** Los Angeles, Calif. $3,192,000. Construction of an electronic weapons precision facility, Naval Shipyard, San Francisco, Calif. Naval Facilities Engineering Command, Washington, D.C. N62474–68–C–0108.

—**General Motors Corp.,** Goleta, Calif. $1,150,000. Production of electronic assemblies for Mk. 48 torpedoes. Naval Ordnance Systems Command, Washington, D.C. N00017–69–C–1306.

27—**Raytheon Co.,** Sudbury, Mass. $25,256,155. Poseidon guidance system electronics assemblies and components. Waltham, Mass. Naval Strategic Systems Project Office, Washington, D.C. N00030–69–C–0127.

—**Hazeltine Corp.,** Little Neck, N.Y. $1,065,849 (contract modification). Classified electronic equipment. Naval Air Systems Command, Washington, D.C. N00019–69–C–0396.

—**North American Rockwell Corp.,** Columbus, Ohio. $5,040,000. OV–10B aircraft. Naval Air Systems Command, Washington, D.C. N00019–69–C–00696.

—**Hughes Aircraft Co.,** Canoga Park, Calif. $1,301,000. Continued development of an advanced short range infrared air-to-air missile guidance system. Naval Air Systems Command, Washington, D.C. N00019–69–C–0631.

—**PRD Electronics, Inc.,** Jericho, N.Y. $8,184,800 (contract modification). VAST (Versatile Avionics Shop Test) stations for A–7E aircraft. Naval Air Systems Command, Washington, D.C. N00019–69–C–0334.

—**PRD Electronics, Inc.,** Westbury, N.Y. $4,604,323 (contract modification). Increase in limitation of authorization for VAST building blocks and data transfer units. Naval Air Systems Command, Washington, D.C. N00019–68–C–0449.

—**Dyson and Co.,** Pensacola, Fla. $1,106,824. Construction of a deep ocean engineering pressure building, Naval Ships Research and Development Laboratory, Panama City, Fla. Naval Facilities Engineering Command, Washington, D.C. N62467–69–C–0070.

—**Gravier and Harper, Inc.,** Alexandria, La. $3,617,000. Construction of a composite medical facility, England AFB, La. Naval Facilities Engineering Command, Washington, D.C. NBy 90393.

—**American Shipbuilding Co.,** Lorain, Ohio. $5,458,655. Construction of a 275-foot Patrol Escort (PF) ship. Naval Ship Systems Command, Washington, D.C. N00024–69–C–0313.

—**Raytheon Co.,** Hawthorne, Calif. $1,980,000. Rebuilding nine radar systems (AN/TPS–22). Marine Corps Headquarters, Washington, D.C. M00027–69–C–0208.

—**Bendix Corp.,** Owings Mills, Md. $1,800,000. Rebuilding of nine AN/TPS–34A/B radar systems. Marine Corps Headquarters, Washington, D.C. M00027–69–C–0207.

30—**RCA Corp.,** Van Nuys, Calif. $1,388,880. classified electronic countermeasure equipment. Naval Ship Systems Command, Washington, D.C. N00024–69–1396.

—**Sanders Associates, Inc.,** Nashua, N.H. $1,336,033. Two units of classified electronic countermeasure equipment. Naval Ship Systems Command, Washington, D.C. N00024–69–C–1445.

—**Hughes Aircraft Co.,** Fullerton, Calif. $1,255,400. Design and development of Navy Tactical Data Systems modified data display. Naval Ship Systems Command, Washington, D.C. N00024–69–C–1260.

—**General Dynamics Corp.,** Groton, Conn. $9,454,450. Overhaul and alteration of USS Dace (SSN–607). Naval Ship Systems Command, Washington, D.C. N00024–68–C–0273.

—**Singer-General Precision, Inc.,** Glendale, Calif. $2,947,338. Automatic data recording equipment. Naval Regional Procurement Office, Brooklyn, N.Y. N00140–69–C–0337.

—**Fred Loffredo,** Lafayette Hill, Pa., $1,725,000. Construction of barracks at Naval Station, Philadelphia. Naval Facilities Engineering Command, Washington, D.C. N62472–69–C–0053.

—**North American Rockwell Corp.,** Anaheim, Calif. $4,471,900. Equipment pertaining to ASB12 bomb directional sets for RA–5C aircraft. Naval Aviation Supply Office, Philadelphia, Pa. N00383–69–A–0005–0033.

—**American Cement Corp.,** Los Angeles, Calif. $4,672,500. Type 1 Portland cement in commercial export bags (containerized). Crestmore, Calif. Naval Purchasing Office, Los Angeles, Calif. N00123–69–D–2122.

—**Maxson Electronics Corp.,** Great River, N.Y. $1,313,234. Electronic warfare trainer devices, 15E28. Naval Training Device Center, Orlando, Fla. N61339–69–C–0311.

—**Computer Sciences Corp.,** Silver Spring, Md. $5,579,361. Research and development of Acoustic Intelligence Data System. Navy Purchasing Office, Washington, D.C. N00600–69–C–1166.

DEPARTMENT OF THE AIR FORCE

4—**Hughes Aircraft Co.,** Culver City, Calif. $1,172,477. Production of modification kits and supporting technical data applicable to the F–4C and F–4D aircraft. Tucson, Ariz. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. F04606–68–S–0225–QP12.

5—**Boeing Co.,** Seattle, Wash. $1,960,000. Production of components applicable to the second stage of various launch vehicles. Space and Missile Systems Organization, (AFSC), Los Angeles, Calif. F04701–69–C–0072.

—**General Dynamics Corp.,** Fort Worth, Tex. $1,421,259. Modification and repair of B–58 aircraft. Waco, Tex. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. F41608–68–C–2200.

6—**General Electric Co.,** Utica, N.Y. $3,233,400. Production of spare parts for airborne radar equipment. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F34601–68–A–2099.

—**Goodyear Aerospace Corp.,** Akron, Ohio. $1,455,582. Production of large cargo pallets adapted for mechanized loading and unloading of air cargo. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F34601–69–A–1044.

11—**Fairchild Hiller Corp.,** Germantown, Md. $15,180,593. Repair and modification of C–119 aircraft. St. Augustine, Fla. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603–68–C–1633.

17—**Radio Corporation of America,** Moorestown, N.J. $4,340,000. Operation and maintenance of radar tracking facilities. Moorestown, N.J., Lexington, Mass., Kwajalein, Marshall Islands, Honolulu, Hawaii, and San Francisco, Calif. Electronic Systems Division, (AFSC), L. G. Hanscom Field, Mass. F18628–69–C–0186.

—**C. W. Matthews Contracting, Co., Inc.,** Marietta, Ga. $1,739,974. Repair and replace aircraft parking apron, Charleston AFB, S.C. 437th Military Air Wing, Charleston AFB, S.C. F38610–69–C–0193.

—**Boeing Co.,** Renton, Wash. $1,034,868. Modification kits for C–135 aircraft. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F04606–68–A–0149.

18—**McDonnell Douglas Corp.,** St. Louis, Mo. $2,322,600. Modification kits for F–4D aircraft. Robertson, Mo. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. F34601–69–A–2245.

19—**Northrop Corp.,** Palos Verdes Peninsula, Calif. $1,108,364. Modification kits for the Minuteman weapon system. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. F42600–69–C–1979.

—**Chicago Aerial Industries, Inc.,** Barrington, Ill. $2,883,891. Procurement of aerial photographic equipment. Aeronautical Systems Division, (AFSC), Wright-Patterson AFB, Ohio. F33657–69–C–1085.

—**Sylvania Electric Products, Inc.,** Needham Heights, Mass. $1,263,610. Depot maintenance for the tactical satellite communication program. Electronic Systems Division, (AFSC), L. G. Hanscom Field, Mass.

—**Federal Electric Corp.,** Paramus, N.J. $73,644,354. Operation and maintenance of the Dewline, the North Atlantic Radio System, and the communication and electronic system at Thule AB, Greenland. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F04606–69–C–1108.

20—**Serv-Air Inc. of North Carolina,** Enid, Okla. $8,953,259. Operation and maintenance services, Vance AFB, Okla. F41608–69–C–3549. $2,472,926. Operation and maintenance services, Sheppard AFB, Tex. F41608–69–C–3572. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.

—**Sylvania Electronic Products, Inc.,** Needham Heights, Mass. $1,978,000. Digital data modems. Electronics Systems Division, (AFSC), L. G. Hanscom Field, Bedford, Mass. F19628–69–C–0278.

—**Koppers Co.,** Baltimore, Md. $1,733,958. Noise suppressor system for F–4 aircraft. Aeronautical Systems Division, (AFSC), Wright-Patterson AFB, Ohio. F33657–69–C–1195.

—**American Electric, Inc.,** La Mirada, Calif. $1,590,206. 500-pound bombs. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. F42600–69–C–3290.

23—**Federal Electric Corp.,** Paramus, N.J. $36,766,054. Operation, maintenance and logistic support of the White Alice communications system, Alaska. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F04606–69–C–0894.

—**Federal Electric Corp.,** Paramus, N.J. $49,406,517. Services and materials for the operation, maintenance and logistics support of the Ballistic Missile Early Warning System (BMEWS). Thule AB, Greenland, Clear, Alaska, and Paramus. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F04606–69–C–0555.

—**RCA Service Co.,** Camden, N.J. $7,800,000. Operation, maintenance and logistics support of the BMEWS. Thule, Greenland, Clear, Alaska, and Camden. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F04606–69–C–1256.

—**RCA Service Co.,** Camden, N.J. $3,207,195. Operation, maintenance and logistics support of the White Alice communications system. Anchorage, Alaska. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F04606–69–C–1257.

—**General Electric Co.,** Cincinnati, Ohio. $71,563,200. Production of J–79–GE–17 engines and spare parts for ground equipment for RF–4E aircraft. Evendale, Ohio. Aeronautical Systems Division, (AFSC), Wright-Patterson AFB, Ohio. F33657–68–C–1232.

24—**Hayes International Corp.,** Birmingham, Ala. $1,366,033. Management services and world-wide distribution of Air Force publications. Middle River, Md. Procurement Division, 2750th Air Base Wing, Wright-Patterson AFB, Ohio. F33601–67–C–0853.

—**Lockheed Aircraft Corp.,** Ontario, Calif. $14,705,000. Maintenance services for TF–104G aircraft. Luke AFB, Ariz. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F04606–70–C–0003.

25—**Industrial Acoustics Co.,** Bronx, N.Y. $1,818,244. F–111 noise suppression systems. Aeronautical Systems Division, (AFSC), Wright-Patterson AFB, Ohio. F33657–69–C–1032.

—**Lockheed Aircraft Corp.,** Marietta, Ga. $5,091,065. Engineering, design, fabrication and installation of modified wings on C–130B/E aircraft. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603–68–C–2530–P005.

—**Litton Systems, Inc.,** Woodland Hills, Calif. $1,460,000. Repair of gyroscopes for F–4 aircraft. Oklahoma Air Materiel Area, (AFLC), Tinker AFB, Okla. F04606–68–A–0147.

26—**McDonnell Douglas Corp.,** Tulsa, Okla. $15,800,000. Modification, and inspection and repair as necessary (IRAN) of B–52 aircraft for FY 1970. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601–69–C–4368.

27—**Radio Corp. of America,** Moorestown, N.J. $1,887,840. Operation and maintenance of the Moorestown radar tracker/sensor facility. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F33657–69–C–1124.

—**Elder-Oilfield, Inc.,** Houston, Tex. $7,921,158. Production of 380 modular prefabricated two-story housing units. Vicksburg, Miss. Air Forces Supply and Services, Washington, D.C. F41621–69–C–0089.

—**Motorola, Inc.,** Scottsdale, Ariz. $19,982,021. FMU–56/B and FMU–56A/B fuzes. Armament Development and Test Center, Eglin AFB, Fla. F33657–69–0237.

—**Bendix Corp.,** Towson, Md. $2,446,136. Modification and improvement of the AN/FPS–85 space track radar. Rome Air Development Center, (AFSC), Griffiss AFB, N.Y. AF30(602)–2763.

—**Litton Systems, Inc.,** Woodland Hills, Calif. $4,677,047. Production of component parts and aerospace ground equipment for airborne navigational aids. Aeronautical Systems Division, (AFSC), Wright-Patterson AFB, Ohio. F33657–69–C–1124.

30—**American Coleman Co.**, Littleton, Colo. $1,547,400. Production of aircraft towing tractors (MB–4). Warner-Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603–69–4874.

—**Textron, Inc.**, Belmont, Calif. $2,221,810. Spare parts in support of AN/APS–109 radar homing and warning system for F–111 aircraft. Warner Rohins Air Materiel Area, (AFLC), Rohins AFB, Ga. F09603–69–A–0159.

—**White Glove Building Maintenance, Inc.**, Los Angeles, Calif. $1,192,824. Custodial services from July 1, 1969, to June 30, 1970, at Los Angeles AFS. Space and Missile Systems Organization (AFSC), Los Angeles, Calif. F04693–29–C–0044.

—**Industrial Security Systems, Inc.**, Sherman Oaks, Calif. $1,924,710. Security guards and related services at Los Angeles AFS. Space and Missile Systems Organization (AFSC), Los Angeles, Calif. F04693–69–C–0049.

—**Calavar Corp.**, Santa Fe Springs, Calif. $3,278,462. Truck-mounted servicing platforms for C–5A aircraft. Aeronautical Systems Division (AFSC), Wright-Patterson AFB, Ohio. F33657–69–C–1361.

—**Fairchild Hiller Corp.**, Farmingdale, N.Y. $1,553,895. Modification and test flight of F–105 aircraft weapons delivery system. Sacramento Air Materiel Area (AFLC), McClellan AFB, Calif. F04606–68–C–1055.

—**Kollsman Instrument Corp.**, Elmhurst, N.Y. $1,045,579. Production of pressure-temperature test sets, TTU 205B/E. San Antonio Air Materiel Area (AFLC), Kelly AFB, Tex. F41608–69–D–9020.

—**Westinghouse Electric Corp.**, Baltimore, Md. $1,797,598. Modification of B–57G aircraft, revised aerospace ground equipment and data requirements. Aeronautical Systems Division (AFSC), Wright-Patterson AFB, Ohio. F33657–68–C–1050–P041.

—**General Dynamics Corp.**, Fort Worth, Tex. $1,300,000. Update and expension of Air Force electronic warfare evaluation simulator. Aeronautical Systems Division (AFSC), Wright-Patterson AFB, Ohio. F33615–69–C–1705.

—**Ryan Aeronautical Co.**, San Diego, Calif. $1,078,000. Maintenance and operation of the Drone Control Facility at Tyndall AFB, Fla., for FY 1970. Aerospace Defense Command, Ent AFB, Colo. F08637–69–C–0243.

—**Massachusetts Institute of Technology**, Cambridge, Mass. $5,531,004. General research and space communications of interest to Army, Navy, Air Force, and Advanced Research Projects Agency. Lexington, Mass. Electronic Systems Division (AFSC), L. G. Hanscom Field, Mass. AF19(628)5167.

—**Consolidated Systems, Inc.**, Studio City, Calif. $2,668,550. Base support services, including procurement support, property control, and transportation at Los Angeles AFS. Space and Missile Systems Organization (AFSC), Los Angeles. Calif. F04693–69–C–0055.

—**Martin-Marietta Corp.**, Denver, Colo. $33,179,829 (contract modification). Design, development, fabrication and delivery of Titan III–D space booster and associated aerospace ground equipment. Space and Missile Systems Organization (AFSC), Los Angeles, Calif. 04695–67–C–0041.

—The following five contracts have been awarded by the Military Airlift Command, Scott AFB, Ill.:

Airlift International, Inc., Miami, Fla. $4,196,150. Domestic cargo air transportation services in support of AFLC LOGAIR System. F11626–69–C–0038.

Reeve Aleutian Airways, Inc., Anchorage, Alaska. $1,138,217. Air transportation services for movement of personnel and cargo between Elmendorf AFB and various stations within Alaska. F11626–69–D–0009.

Universal Airlines, Inc., Ypsilanti, Mich. $19,609,694. Domestic cargo air transportaiton in support of AFLC LOGAIR System. F11626–69–C–0039.

Overseas National Airways, Inc., Jamaica, N.Y. $6,666,354. Domestic air transportation in support of AFLC LOGAIR System. F11636–69–C–0040.

Overseas National Airways, Inc., Jamaica, N.Y. $10,940,979. Domestic cargo air transportation services in support of Navy QUICKTRANS System. F11626–68–C–0041.

OFF SHORE PROCUREMENT

25—**Canadian Commercial Corp.**, Ottawa, Ontario, Canada. $5,491,114. Nonpersonal services, data and logistics support for FY 1970–72 operation and maintenance of the USAF-Canadian Northeast Wideband System, and operation and maintenance of base support functions at four air stations in Canada. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F04606–69–C–0896.

—**Canadian Commercial Corp.**, Ottawa, Ontario, Canada. $1,494,498. Mobile automatic test sets for avionics support equipment. Rexdale, Ontario, Canada. Naval Air Systems Command, Washington, D.C. N00019–69–C–0615.

27—**Canadian Commercial Corp.**, Ottawa, Ontario, Canada. $3,896,484. Production of telegraph-telephone terminal sets and related items of equipment. Radio Engineering Products, Campbellton, New Brunswick, Canada. Marine Corps Headquarters, Washington, D.C.

Asbestos Fibers Studied for Aircraft Structures

Asbestos fibers may be used to reinforce epoxy resin matrixes used in aerospace structures, if an Air Force Materials Laboratory study proves correct. The laboratory is presently evaluating the use of asbestos fiber reinforced plastics in the construction of air-to-ground missiles. In preliminary tests, the asbestos fibers cut costs of composites considerably. Other composite reinforcement materials cost from $7.50 to $300 per pound, while asbestos is only $1. And when used as a replacement for aluminum in a missile case, asbestos reduced the cost from $500 to $150.

The main reasons for considering asbestos fibers were low cost, availability, heat and corrosion resistance, and high strength. As used in composites, asbestos fibers are 25 percent lighter than aluminum, and less detectable by radar than metal structures.

Major problems still unsolved, however, are finding a chemical treatment that will give better adhesion to the fiber surface, and compiling adequate design data and processing information.

Preliminary tests, conducted on epoxy resin and unidirectional short fiber crocidolite asbestos fibers, have shown that the asbestos fibers give flexural and compressive strengths and specific flexural and compressive modulus values approximately 15 percent above those of equivalent glass fiber composites.

Engineers believe that this preliminary data indicates that asbestos' high inherent strength and stiffness can be translated into low-cost, high-performance composites for use in sandwich skins for aircraft, in the same manner that boron, glass and graphite filaments are now used.

Project engineer on the work now being conducted at the Air Force Materials Laboratory, Wright-Patterson AFB, Ohio, is T. J. Reinhart of the Materials Support Division.

FY 1970 Industrial Security Management Course Dates Set

The Defense Department has scheduled the following sessions of the Industrial Security Management Course during FY 1970, to be held at Fort Holabird, Md.: Sept. 22–26; Dec. 1–5; Feb. 2–6, 1970; March 16–20, 1970; and May 4–8, 1970. Contractors interested in attending any one of these sessions should contact their cognizant security office.

Field extensions for the security management course will also be offered, at the following places and dates, hosted by their respective Defense Contract Administration Services Region (DCASR):

Orlando, Fla., Oct. 6–10. Atlanta DCASR, 3100 Maple Dr., NE, Atlanta, Ga. 30305. Phone (404) 261–7310, Ext. 206, 207.

Boston, Mass., Oct. 13–17. Boston DCASR, 666 Summer St., Boston, Mass. 02210. Phone (617) 542–6000, Ext. 804, 805.

Cincinnati, Ohio, June 15–19, 1970. Cleveland DCASR, Federal Office Building, 1240 E. 9th St., Cleveland, Ohio 44199. Phone (216) 522–5334.

Los Angeles, June 22–26, 1970. Los Angeles DCASR, 11099 S. LaCienega Blvd., Los Angeles, Calif. 90045. Phone (213) 643–1084.

Reservations for the extension courses should be placed with the host DCASR.

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Aircraft Vibration Target of Air Force Study

The Air Force Materials Laboratory, Wright-Patterson AFB, Ohio, has developed new uses for "damping," or vibration reducing, materials to increase the life of aircraft components.

The Flight Dynamics Laboratory, also at Wright-Patterson, brought the problem to the attention of the Materials Laboratory Strength and Dynamics Branch. A fix was defined when F–100 antennas began failing after a few missions. From this, a nitrile rubber split-ring damper was developed and fabricated that attached to the electrical connector at the center of the antenna.

This viscoelastic damper, tuned to frequency of the structure at the attachment point, dissipated the energy, instead of transmitting it to the antenna. The result was a 12-fold increase in antenna life.

The Materials Laboratory is continuing work on vibration materials in an effort to eliminate vibration problems in all kinds of aircraft and spacecraft, and to advance the state of the art.

Army Sets Up Task Force for Night Vision Devices

"Task Force Riposte," charged with the responsibility of planning and monitoring the integration of all surveillance, night vision and target acquisition devices into the Army, has been created by the Army Combat Developments Command (CDC), Fort Belvoir, Va.

For the first generation of night vision devices now entering service, Riposte will validate the requirements for such equipment, write doctrine for its use, and place the devices within the Army's Tables of Organization and Equipment. Riposte will also evaluate field and troop tests of the devices.

The long-range mission of Riposte will be to develop requirements for second-generation equipment for the Army through 1985. The goal is a family of devices enabling field troops to see in darkness, detect the enemy, and direct fire on target.

Contemporary and future night detection devices are of three varieties: radar, night vision devices, and sensors. Radar and infrared night vision devices are limited, however, by their emissions which can be monitored by the enemy. Starlight scopes, electro-optical instruments which amplify existing light, and sensors are passive, virtually undetectable, and seem promising as both offensive and defensive night detection devices.

Sensors, relatively new in development, can be made to detect human, ferrous metal, or mechanical emanations. Conceivably, they could be made to detect the passage of anything from people to motorcycles to trucks, indicating the amount of ferrous metals present, and the numbers passing any given point.

This information, according to CDC, could then be relayed to remote collection centers, where computers would compile and evaluate the data. Artillery, air strikes, or field operations could then be directed to counter enemy movements or concentrations.

These second generation night detection devices will be designed for use by the individual rifleman, the unit and tank commanders backing him, and the airmobile commander overhead.

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